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Clinical Therapeutics

A Handbook on the Special Treatment of Internal Disease

BY

ALFRED C. CROFTAN

Author of "Clinical Urinology."

Second Edition, Revised

> "*Nihil temere affirmandum nihil contemnendum.*"
> (Hippocrates.)
>
> "*Medicine is an Art that sometimes cures, often relieves and always comforts.*"
> (F. Bérard.)

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1907

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1907

"The observation which does not teach the art of healing is not that of a physician; it is that of a naturalist." (Broussais.)

"La thérapeutique est la seule raison d'être de la médicine qui, sans son secours, ne serait guère qu'une méditation sur la mort." (Roger.)

"Die Zeiten des Nihilismus in der Klinik und des Pessimismus in der Praxis sind überwunden, sie liegen hinter uns."

"Die innere Klinik steht heute unter dem Zeichen der Therapie." (v. Leyden.)

"Il importe de rendre à la thérapeutique sa dignité, de ne plus la confondre avec la matière médical, et de remettre en honneur la science des indications." (Bouchard.)

"The doctrinaire in medicine, as in politics or other matters, is commonly a dangerous person." (Duckworth.)

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DEDICATED TO

E. H. C.

PREFACE TO SECOND EDITION

Within the short period of a few months that has elapsed since the issuance of the first double edition no fundamental advances in clinical therapeutics have been made. A number of promising ideas have been advanced by different clinicians, but it is altogether too early to pass judgment on their validity; for the present, therefore, I have preferred to omit them from the new text. Numerous suggestions, however, and a few criticisms that have been offered by readers of the first edition have, whenever feasible, been duly considered and incorporated in the volume. To all those who have been so kind as to aid me in this way I wish to express my sincere appreciation.

Chicago, Aug., 1907.

ALFRED C. CROFTAN.

PREFACE

This book deals alone with the treatment of the sick. Hence the homely ministrations at the bed-side (that mean so much to the patient), the feeding and the bathing, the technique of all mechanical and physical means of treatment, as well as the use of medicines, the choice of climate and resorts, and the indications for surgical intervention are all discussed.

As a profession we have erred in the past in giving too much medicine; we err nowadays possibly in giving too little. With the development of modern pharmacology and the decline of crude empiricism; with the tendency to give a single drug to meet definite indications; with the revival of esthetic medication and the abandonment of nauseous polypharmacy, drugs are recovering their legitimate place in the therapeutic armamentarium even of the most skeptically inclined. In the meantime physical means of treatment, such as hydrotherapy, electrotherapy, massage, the great principles of rest and exercise, all based upon accurate scientific observation, have won the position they deserve. Modern dietetics, founded on the newly-discovered laws of nutrition and metabolism, has become an exact, almost mathematical, procedure. Psychotherapy has been allotted a definite field of usefulness. Organotherapy and, above all, serumtherapy promise much and encourage the hope that our small list of specific remedies will shortly be increased.

No attempt has been made to enumerate all the means and remedies that have at different times been recommended for the treatment of various diseases, for these belong to the historical rather than the immediately practical.

It is well to recognize our limitations in the field of treatment; hence rather than fill pages with a futile confession of our inability to help, a discussion of those disorders that we at present are unable to influence by any treatment has been altogether omitted. For this reason no special Section on Diseases of the Nervous System has been arranged; for unfortunately the majority of the organic diseases of the nervous system, on account of the peculiar character of the lesions and the nature of the affected parts, are not amenable to internal treatment, and the functional disorders of the nervous system are, as a rule, successfully treated only in special institutions. The management of the latter class of cases is discussed in the text under various headings and can be found by consulting the index.

Occasionally an independent classification and grouping of related clinical entities has been attempted, in which I have considered it necessary from the therapeutic standpoint to depart from orthodox anatomic and etiologic classifications. Wherever it was considered essential to a better understanding of therapeutic indications, I have prefaced the statement of the treatment by general remarks relating to etiology and symptomatology.

The author of a work on Therapeutics is of necessity forced to draw largely from personal experience, modified, to some extent, by the opinions prevailing among established authorities. This attitude naturally gives the discussion a subjective flavor, so to speak, which does not appear to me to be undesirable, and, which, above all, can hardly be avoided in a book of this character.

In preparing certain chapters I have been so fortunate as to secure the co-operation of clinicians who enjoy exceptional opportunities for observing the diseases they have written on. Thus Dr. Heman Spalding, as chief medical inspector of Chicago, has had a broad experience with the subject of Small Pox; Dr. William H. Baum, as physician-in-charge of the contagious wards in the Cook County Hospital, has had unusual opportunities for studying Scarlet Fever and Measles. Dr. A. Mayer and Dr. U. Maes, of New Orleans, have written on Yellow Fever. Dr. Wm. A. Pusey has contributed paragraphs on the X-ray treatment of Leukemia and Pseudo-leukemia; Dr. E. F. Wells has written the Section on Pneumonia; Dr. F. S. Churchill on Mumps and Whooping Cough: Dr. F. Kreissl, the Sections on Syphilis and Cystitis and Urethritis and the paragraphs on intra-pelvic applications in the treatment of Pyelitis. To all these gentlemen I wish to express my sincere thanks for their earnest and valuable assistance.

In order to render this volume useful not only for consecutive reading, but also for rapid reference, marginal headings have been inserted throughout and particular care has been expended upon the preparation of a complete and exhaustive index.

ALFRED C. CROFTAN.

Chicago, Nov., 1906.

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CHAPTER I.

DISEASES OF THE CIRCULATORY APPARATUS.

I. THE HEART AND ITS MEMBRANES.

VALVULAR DISEASES OF THE HEART.

Introductory

Lesions about the valves of the heart cannot be repaired by any known means. As soon as one or more of the valves become narrowed or insufficient certain compensatory processes are set in motion that are intended to neutralize the effects of leakage or obstruction and in this way to restore normal circulatory conditions. The object of treatment in valvular lesions of the heart is, therefore, to aid the body in maintaining this balance of compensation, or in restoring it after it has begun to fail. The same indications must be met in so-called muscular or "relative" valvular incompetence not due to valve lesions.

It would merely complicate the understanding of the treatment of valvular disease if each lesion were discussed separately; for the treatment of mitral and tricuspid incompetence and stenosis, on the one hand, and aortic incompetence and stenosis, on the other, is identical; pulmonary stenosis and common congenital lesions of the heart are to be treated like mitral lesions; pulmonary incompetence in its early stage like aortic incompetence, and later, when venous stasis becomes marked, like mitral lesions.

The later manifestations of the different single and combined heart lesions are in most cardinal respects similar; i. e., in nearly all cases there is hypertrophy and dilatation of different portions of the heart, myocardial and arterial degeneration with changes in the blood pressure and ultimately venous stasis and cardiac dropsy in different organs.

From a practical standpoint it is well to distinguish between the treatment of well compensated valvular lesions of the heart and those in which compensation is broken.

TREATMENT OF COMPENSATED VALVULAR LESIONS OF THE HEART.

Avoidance of heart tonics

The most important rule in the treatment of compensated heart lesions is to forego meddlesome interference. It is unfortunate that, in well compensated valvular lesions, when a murmur is accidentally discovered recourse is so often had to the routine use of heart tonics.

General indications

The chief aim of treatment in compensated heart lesions is, (1) to maintain adequate nutrition of the heart muscle that is undergoing, or has undergone, compensatory hypertrophy; (2) to put the minimum strain upon the heart in order to enable it to maintain compensation; (3) to judiciously strengthen the heart muscle by various dietetic, climatic and hydro-therapeutic means, using drugs for this purpose very sparingly, and preferably not at all.

Subjective symptoms in aortic insufficiency requiring special treatment

Fully compensated aortic insufficiency occasionally forms an exception to this rule, for, owing to the peculiar circulatory conditions that are created in this lesion, even when it is fully compensated by hypertrophy of the left ventricle, a variety of disagreeable subjective symptoms are produced about the brain, the respiratory apparatus, the heart and the stomach that call for special symptomatic treatment.

Brain symptoms and vagus symptoms

On account of the sudden regurgitation of the blood during each diastole, ischemia of the brain may be produced, with such symptoms as headache, dizziness, irritability, and a general psychic state resembling neurasthenia, with occasional fainting spells. At the same time dyspnea is not uncommon, produced presumably by irritation of branches of the pulmonary plexus and of the vagus from direct pressure of the enlarged heart upon these nerves.

Opium

In all these conditions the best remedy is opium; for in cerebral ischemia this drug acts in appropriate doses as a tonic to the higher nerve centers and produces plethora of the brain vessels which successfully counterbalances the anemia produced by the aortic insufficiency; at the same time by acting as a nerve sedative it relieves the nervous dyspnea discussed above.

Contra-indications to the use of opium

There is one contra-indication to the use of opium or morphine in aortic insufficiency, and that is derangement of the excretory powers of the kidneys. If the latter are diseased opium treatment should not be instituted, for otherwise a cumulative action due to deficient elimination of opium may be brought about. Idiosyncrasies to opium and morphine should, of course, also be included in the calculation; hence it is well, in these cases, to proceed with caution and to administer small doses in the beginning in order to study the effect of this drug upon the individual. It is best to begin with the hypodermic injection of doses of morphine hydrochlorate, not to exceed one-twelfth grain (0.005 gm.), gradually increasing the amount if no untoward symptoms appear. That it is best not to let the patients know what drug they are receiving need hardly be emphasized as otherwise the morphine habit may be created. If after a few days it is found that morphine is tolerated and if

Dose and administration

the symptoms are relieved by it, then the internal administration either of morphine or of opium may be begun. Here, powdered opium in doses of from one-third to one and one-half grains (0.02 to 0.1 gm.), or laudanum in doses of five to twenty drops, may be given. As a tolerance for the drug is gradually established larger doses will have to be given.

Bromides and quinine

If the use of opium or its alkaloids is contra-indicated, or if the patient develops too great a tolerance for them, bromides may be used to advantage for the dyspneic symptoms and quinine for the cerebral signs; the former preferably as sodium bromide in fifteen or thirty grain doses (1 to 2 gm.) in milk or soda water; the latter as quinine hydrobromate in doses of five to fifteen grains (0.3 to 1 gm.), two or three times a day.

Epigastric pain and palpitation

Two other disagreeable subjective symptoms sometimes require special treatment in well compensated cases of aortic insufficiency, viz., epigastric pain occasionally assuming the character of gastralgic attacks, and palpitation. The former condition is presumably a neurosis of the celiac ganglia or of the abdominal sympathetic produced by the continuous shocks that these nervous elements undergo when the abdominal aorta pulsates violently.

Cold to the precordium and epigastrium

Leiter coil

Heat

The best local treatment both for the epigastric pain and the palpitation is the application of cold to the epigastric or precordial regions; an ice bag may be applied for an hour, then removed for an hour and reapplied for an hour, and this plan continued until the distress is relieved. Occasionally the continuous application of cold by means of a "Leiter Coil" for several hours is more efficacious. This apparatus consists of a flat coil of thin rubber or metal tubes fastened to a piece of cloth or rubber that can be shaped to fit the outline of any part of the body. The cold water flows, from a pitcher that is elevated about three or four feet above the patient, through the Leiter apparatus to a pan placed at the foot of the bed. As the calibre of the tubes is very small the water flows slowly and the pitcher does not have to be filled more than once an hour or so. The flow is started by sucking on the lower tube. Rarely, heat applied locally by means of a hot water bag acts more beneficially than cold.

Opium
Bromides
Quinine
Valerian

Cocaine in gastralgia

Of drugs opium, quinine and bromides are again useful in these conditions, the bromides particularly in severe nervous palpitation (see also page 68). Valerian in the form of quinine valerianate, dose one to three grains (0.5 to 0.15 gm.), is also often useful. In extreme cases of gastralgia cocaine may be used. A convenient way to administer the drug in this condition is to prepare a five per cent. solution, to pour twenty drops of this into about one-third of a glass of water and to administer a teaspoonful of this mixture every fifteen minutes for four or five doses or until the pain is relieved.

Diet

In the treatment of all compensated valvular lesions of the heart the diet is of extreme importance. It should be nutritious so that the heart muscle can sustain the excessive labor that it is forced to perform in order to maintain compensation, it should neither irritate the heart nor, by distending or inflating the stomach and bowels, mechanically interfere with the heart's action.

The diet should, therefore, incorporate the full complement of calories requisite to maintain nutritive equilibrium (see the Chapter on *Metabolic Disorders.*) Large meals should, however, never be allowed, for a full stomach pushes the diaphragm upwards, interferes with its respiratory excursions, and hence embarrasses the right heart.

No large meals

Aside from mechanically interfering with the heart's action large meals favor a determination of venous blood to the digestive viscera and hence impose much labor on the right heart, while at the same time setting certain nervous reflexes in motion that cause palpitation and irregular cardiac action. Therefore a patient with a compensated heart lesion should be instructed to eat small meals, at frequent intervals, rather than two or three large meals at long intervals.

Avoidance of fermenting foods

For similar reasons the diet should contain a minimum of those articles that cause gaseous distension of the stomach, as for instance, cabbage, potatoes, peas, beans, lentils, sauerkraut and aërated beverages. Nor should the diet contain any articles that can irritate the heart, for stimulation of the heart muscle when it is already working excessively is to be strenuously avoided; thus all meat extractives (see below), condiments and spices, tea and coffee should be forbidden. Alcoholic beverages should be taken very moderately and tobacco should, preferably, be absolutely forbidden.

Extractives

The diet should therefore consist largely of albuminous and fat foods and should contain relatively little of starchy foods.

Albumen-fat diet

An albuminous diet increases the hemoglobin content of the blood so that the nutrition of the heart muscle is thereby aided. Some discretion should be exercised in advising the kind of albuminous food and its mode of preparation. Raw, rare, smoked and cured meats, as well as all internal organs like liver, sweetbreads, kidneys, etc., should be forbidden, or at least greatly restricted, because they are rich in extractives, and the latter (consisting largely of purin bases and their congeners), notoriously irritate the heart and increase the blood pressure. For the same reason bouillons and meat extracts should be tabooed, for they are practically a solution of these extractives. All other meat preparations, all vegetable albumens and milk, are very useful sources of readily digestible albumen.

Fats

Fats, in the form of butter, cream, olive oil, a little bacon, mayonnaise, etc., are valuable adjuvants to the diet, for they possess a high nutritive value (1 gm. of fat develops nine calories) and at the same time soon produce a sense of satiety and hence prevent the patient from overloading the stomach. Fresh or stewed fruits and green vegetables fulfill a similar purpose and also act beneficially by counteracting constipation.

Carbohydrates

The use of bread, potatoes, pastry, cereals, rice, sweets and other carbohydrates should be reduced to the minimum compatible with maintenance of the appetite and the enjoyment of food, for starchy and sweet foods are apt to produce flatulency and if taken abundantly cause engorgement of the liver and consequently impose added labor upon the right heart, which, above all, should be spared in valvular lesions; for the right ventricle is by structure less fitted to undergo compensatory muscular hypertrophy than the left ventricle.

Reduction of liquids

One of the most beneficial dietetic means of treating compensated valvular lesions of the heart is to reduce the liquid intake. For in this way the heart and arteries are relieved of much labor, the stomach is not so apt to become distended, the blood becomes more concentrated and hence acquires more hemoglobin to the unit, and the weight of the body is reduced.

Oertel's explanation

Various theories have been advanced to explain these phenomena, but none of them as yet offers a convincing explanation. Practical experience demonstrates clearly, however, that drink restriction generally produces good results both in compensated and in decompensated valvular lesions of the heart. Oertel, who originated, or, better, revived the method of drink restriction in heart disease, presupposed the existence of an hydremic plethora, i. e., an increase of the volume of the blood, especially in cases of failing compensation, which could only be corrected by reducing the amount of liquid ingesta and at the same time favoring the elimination of water by the various emunctories of the body. Exact determinations of the specific gravity and the freezing point of the blood have not borne out this postulate. So much is clear, however, that all of the water that is introduced into the stomach must needs pass several times through the heart and arteries before it leaves the body by the lungs, the kidneys and the skin, or becomes deposited in the tissues; and it is self-evident that this labor can be reduced by giving less liquid and that consequently the heart is thereby

Mechanical explanation

spared. For this reason drink restriction constitutes a very valuable prophylactic measure, and also has a place, subordinate, it is true, to other more energetic means in the treatment of decompensated heart lesions.

Determination of water equilibrium

It is frequently important to determine whether a disturbance of the water equilibrium has already occurred, and this can best be done by measuring, for several consecutive periods of twenty-four hours, the water intake and output. If it is found that the excretion of water is far below the intake and if, above all, the patient during the period of observation gains several pounds in weight, then one is justified in assuming that retention of water is taking place, that, in other words, the heart and arteries are beginning to fail in their task of pumping the water to the emunctories of the body. When this occurs the patients should be instructed to reduce their liquid intake to about one to one and one-half litres of water or other fluids in the twenty-four hours. This restriction is frequently borne with difficulty, but most patients soon become accustomed to it, especially if the importance of the measure is explained to them. That more water should be allowed in summer than in winter is clear, for the loss of water via the sweat glands must be compensated; or if there is diarrhea or emesis the loss of water from the bowels or the stomach should also be replaced.

Technique of drink restriction

Fasting

In extreme cases in which compensation threatens to fail the water intake should be still further reduced. Occasionally it is a good plan to impose a complete fast for twenty-four or forty-eight hours. It will be found that when solid foods are withdrawn the craving for liquids is simultaneously reduced; for a fasting individual, even when allowed to drink water without restraint, will rarely take more than one litre in twenty-four hours. This is, of course, a heroic plan to be employed only in emergencies, but it will often be found of inestimable value. That the diet should contain as little sodium chloride (common salt) as possible need hardly be emphasized in this connection; for the ingestion of sodium chloride requires the ingestion of water to hold it in proper molecular concentration in the blood and hence, as is well known, produces thirst. That the amount of water drinking must also be governed somewhat by the presence or absence of complicating diseases, e. g., certain renal and metabolic disorders, fever, etc., need hardly be emphasized.

Reduction of common salt

Rest and exercise

In all valvular lesions of the heart the regulation of rest and exercise is of extreme importance. It is a well known fact that many cases of heart disease, with threatening decompensation, recover completely when placed at rest without further

Rest after meals

treatment. In cases of valvular trouble without compensatory disturbances, complete rest in bed is, of course, unnecessary, but certain simple rules should nevertheless be adhered to in order to avoid over-taxation of the heart. Thus such patients should avoid moving about for an hour or more after meals, especially if they cannot adopt the plan of eating small quantities at frequent intervals; for after a heavy meal nearly two-thirds of the total blood collects in the abdominal veins, and it is manifestly a precarious procedure in valvular disease to force all this blood through the right heart towards the periphery, an event that will invariably occur if muscular exercise is indulged in during the period of digestion. Exercise after a full meal generally produces a rise in arterial pressure and venous congestion in the lesser circulation, and this is to be avoided.

Terrain cure

Schott treatment

The occurrence of dypsnea and of precordial distress after exercise is always a danger signal and the patients should be carefully instructed never to exert themselves to this point. In cases of compensated valvular lesions, and this applies also to cases in which the balance of compensation is not quite established, the so-called Terrain cure, i. e., graduated exercises on measured inclined paths, and the Schott exercise treatment* are frequently useful. They can best be carried out in certain resorts, chiefly *Nauheim,* where all arrangements for these treatments as well as skilled attendants can be found.

Swedish massage

General massage

Massage of the heart

Swedish massage, a plan of treatment that can be pursued at home, is of great value in the treatment of compensated heart lesions. It consists in a series of resistance exercises that must be regulated according to each individual case and should be carried out by an expert masseur. Some cases, owing to individual peculiarities that we do not understand, cannot bear these resistance exercises; it is well, therefore, to avoid all routine and to carefully study the reaction of the individual patient before advising the continued use of exercise treatment. All passive exercise treatment acts beneficially by facilitating the flow of venous blood from the periphery to the right heart, by reducing the peripheral blood pressure, increasing respiration, and by all these effects aiding the right heart

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*The Schott treatment is a combination of passive and active and resisting exercises of the trunk and extremities. The cardinal rules laid down by Schott for carrying out his treatment are the following: "1. The exercise should be performed slowly, steadily and without exertion. 2. The same movements should never be performed twice in succession. 3. Each movement should exercise a different group of muscles. 4. The patient should rest after each exercise. 5. The pulse and breathing should be constantly controlled by the physician." The exercises should be performed for about half an hour in the morning and for twenty minutes in the afternoon, including pauses. If symptoms of stasis or stenocardiac attacks appear, the exercises must be stopped.

General massage is always useful for it, too, facilitates the back flow of the peripheral blood towards the right heart and, unless carried out too vigorously, reduces the arterial blood pressure and thus spares the heart. Massage of the heart itself has also been recommended but, unless carried out by an expert, this practice is altogether useless and may become dangerous.

All exercise treatment should be carried out for a long time if any real benefits are to accrue. The patients with compensated heart lesions should endeavor to live as much as possible out of doors; for the breathing of abundant oxygen, by promoting full aëration of the blood, will exercise a beneficent effect upon the nutrition of the heart muscle.

Out door life

Climate

Here the selection of a suitable climate must be arranged. Four elements must be considered in selecting a resort for a case of valvular disease, viz., altitude, the mean temperature, the temperature variations, and the humidity.

Altitude

The decrease of the barometric pressure at an altitude favors elimination of water and gases from the surfaces of the body and from the lungs, and stimulates an increase of the number of red blood corpuscles and of the total hemoglobin, hence increases respirations, exaggerates metabolism and improves the nutrition of the heart while, at the same time, increasing its labor. By sending patients to moderate altitudes this effect can be utilized to advantage as a mild stimulant and hence an exercise for the heart; but too great altitudes must be avoided for fear of overworking the heart and breaking the balance of compensation. Patients with heart disease, therefore, should be warned against altitudes over three thousand feet, and if no decompensation whatever is present, should be advised to live at an altitude between fifteen hundred and two thousand feet above sea level. If compensation threatens to fail, the patient should at once be removed from the altitude back to sea level.

Hot and cold climates

Extreme degrees of heat and cold should always be avoided in heart disease. Heat is always bad, for it exercises a depressing effect upon the whole organism, including the heart. Extreme cold, on the other hand, both by producing contraction of the peripheral arteries and by direct nervous influence upon the heart, raises the blood pressure and stimulates the heart to greatly increased activity that may fatigue the organ if its valves are diseased. Inasmuch, however, as it is easier by proper clothing to protect the body from the effect of cold than from the effect of heat, a cold climate, other things being equal, is less dangerous for a case of valvular disease of the heart than a hot one. Best of all, of course, is a temperate climate with slight temperature variations and no extreme degrees of heat or cold.

Humidity

The humidity must, finally, also be considered in selecting a resort for a heart case. A dry, warm climate is always to be preferred to a moist, warm climate; for, when the air is dry, insensible perspiration enables the organism better to counteract the depressing effects of great heat than if the atmosphere is moist; and a dry, cold climate is more beneficial than a moist, cold climate, because in the former there is less radiation of heat than in a moist atmosphere so that the body can maintain its temperature with less tax upon the general metabolism and hence upon the cardio-vascular apparatus.

Bathing

Hot baths

Cold bathing

Sea bathing

There is a popular prejudice against bathing in heart disease. Since the principles of hydriatic treatment have been made the subject of accurate scientific research, the exact indications and contra-indications for warm and cold bathing in heart disease are better understood. Very hot baths (100° F. and above), owing to their depressing effect, are always to be avoided, for immersion of the body in hot water, by producing first a sudden short contraction followed promptly by a relaxation of the cutaneous vessels, and later a lasting contraction, always taxes the vaso-motor center and the heart. In individuals with well compensated heart lesions, who are of the neurasthenic type, this practice is particularly dangerous because in such subjects the vaso-motor centers are already in a state of unstable equilibrium; and in sufferers from arterio-sclerosis the fragility of the arterial walls renders hot bathing most precarious. Cold bathing should also be forbidden in any case of heart disease, for the application of cold to the surface of the body always produces a severe initial shock with a reflex increase of the heart's action and contraction of the peripheral arterioles, in other words, high arterial tension, and this means a strain and possibly an over-taxation of the heart. Sea bathing should therefore, always be forbidden.

Lukewarm baths

Salt baths

Carbonated baths

Lukewarm bathing, viz., immersion of the body for ten or fifteen minutes at a time in water of 90° to 95° F., i. e., slightly below the temperature of the body, is a very useful means of treatment. The water may be medicated by the addition of four to five pounds of salt to a bath tub full of water. In Nauheim, Kissingen, Marienbad, Franzensbad and other watering places baths with carbonated water are given. They can be prepared at home as follows: Half a pound of sodium bicarbonate is dissolved in a bath tub full of water (of about 90° F.) and about three-quarters of a pound of commercial hydrochloric acid are slowly added, care being taken that there is always an excess of soda. The patient should at first not remain in the tub for longer than five minutes, nor should he be given such a bath in the beginning oftener than once every other day. Later the bath may be administered daily and for fifteen to twenty minutes at a time. The temperature of the water should not be allowed to drop below 80° F. After the bath the patient should be dried with warm cloths and put to bed for half an hour or an hour, with a hot water bottle to his feet. The patient should never become dyspneic while in the water; as soon as breathing becomes oppressed the bath should be stopped.

Rationale of bath temperatures slightly below the body temperature

The good effects derived from bathing in lukewarm water can be explained in this way: The temperature of the water, being slightly below the body temperature, exercises a very mild stimulation, through the peripheral and vaso-motor nervous system, upon the action of the heart, slowing and at the same time strengthening its beat; the salt or the carbonic acid gas cause some relaxation of the peripheral capillaries and hence a decrease in the blood pressure. This means that the heart is being gently driven while its work is being reduced. Judiciously carried out, this treatment, therefore, constitutes an ideal exercise for the heart when its energies are beginning to flag.

Medicines in compensated valvular lesions

The use of medicines in compensated heart lesions is to be eschewed. Only rarely should it become necessary to give any heart tonic or vaso-dilator, or any of the other remedies that are to be presently discussed under the heading of decompensated heart lesions; nor is any special benefit to be derived from the use of so-called general tonics. That drugs may occasionally be necessary to regulate the function of the stomach or the bowel, or to correct an underlying anemia with relative incompetence of the heart valves is self-evident. This medicinal treatment will be discussed in other chapters.

Drugs useful in the treatment of certain subjective symptoms of compensated aortic insufficiency have been discussed above.

THE TREATMENT OF VALVULAR DISEASES OF THE HEART WITH FAILING OR BROKEN COMPENSATION.

Rest

Position in bed

The most important element in the treatment of failing compensation is absolute rest in bed. In cases of cerebral anemia, i. e., chiefly in aortic insufficiency, the horizontal position may be the most agreeable to the patients, but, as a rule, they will be more comfortable when semi-recumbent or sitting up during a part of the day, even if there is some dyspnea; for the blood pressure is always lower when the patient is erect or semi-erect than when in a horizontal position. It is generally difficult to persuade patients in early stages of decompensation to go to bed. If the matter is fully explained to them, however, they will usually comply with this order. As Brunton puts it, the patient should be told, "If you have sprained your ankle, you know perfectly well that every movement that you make is likely to keep up the mischief. What you must do is to go to bed and keep the ankle perfectly quiet. You must give the heart rest just as you give rest to the ankle. If you go on walking with the sprained ankle, it will become worse and worse, and finally you will be unable to do anything with it. If you go on exercising with a strained heart, then you will continue to get worse, and in the end you must either give it rest or die." Rest in bed to be efficacious should be continued for several weeks; the results obtained are frequently brilliant, and very often one will be able to get along very well without the use of any heart tonics or other medication.

Diet

The diet should be essentially the same as in compensated lesions of the heart, especially if the patient is put to bed before the appearance of dropsies or passive congestion in different organs. If such complications of broken compensation have already made their appearance then the patient should be put, for a time at least, upon a diet consisting largely of milk; for milk possesses a distinct diuretic action and constitutes an ideal food. It should be given at frequent intervals, in small quantities, preferably in the form of a milk-cream mixture, consisting of a tumbler full (i. e., about nine ounces) of a mixture of two-thirds milk and one-third cream to which are added two teaspoonfuls of lime water. It is rarely advantageous to put these cases upon an exclusive milk diet for the flooding of the circulatory apparatus with water is decidedly harmful. (See also page 210). A little fresh fruit, an egg, or a little meat and some crackers may usually be added with impunity.

Milk diet

Cold to the precordial region

The application of cold continuously or intermittently to the precordial region is a very valuable adjuvant to treatment and should be employed as described under compensated heart lesions (see page 19). If rest and a simple diet and local cold do not restore compensation in mild cases within a week or ten days, or if the case comes under observation at a time when decompensation is far advanced, so that edema and congestion of the lungs, the liver, the kidneys and other organs are present, then it becomes necessary to use heart tonics.

Indications for the use of heart tonics

The heart normally possesses a certain amount of reserve force which it utilizes as soon as an excessive strain is thrown upon it. It responds, as is well known, to any sudden overtaxation by dilatation, a prolongation of the diastole and an increased force of the systole. In valvular diseases this reserve force is called upon continuously to establish compensation, and in order to meet this added requirement hypertrophy, especially of the left ventricle, occurs. An ideal heart tonic, therefore, should aid the heart in prolonging its diastole and in enforcing its systole to the maximum.

Digitalis

The chief representative of this group of heart tonics is digitalis, for in appropriate doses it possesses precisely this power. Its chief effect is exerted upon the ventricles, stimulating them to increased contraction so long as the heart muscle is not in an advanced stage of degeneration. Digitalis also raises the peripheral blood pressure, partly from its action upon the heart muscle and the nerves of the heart, partly from its effect upon the vaso-motor centers, which it stimulates to cause contraction of the vessel walls; at the same time, it slows the action of the heart. Under the influence of digitalis the nutrition of the heart generally improves; this is due to the increased amount of blood supplied to the heart muscle when the ventricle contracts more energetically.

Dose of digitalis

The dose of digitalis is very important, for large amounts of the drug frequently produce an effect that is exactly opposite to that exercised by small doses, viz., they reduce the force of the systolic contractions and in lethal doses cause arrest of the heart in diastole. Its action is tardy, as it is slowly absorbed, so that a day or two may elapse before the effect of the drug upon the heart and the pulse becomes apparent. If the dose is increased too rapidly in the beginning (because its effect may not have appeared at once) intoxication from cumulative action may occur; and as the excretion of digitalis is as slow as its absorption, there is also always danger of cumulative action from disturbed excretion. Some individuals, moreover, seem to possess an idiosyncrasy against digitalis while others show a remarkable tolerance to its action. It is therefore always best to begin with small doses, and during the first days of its administration to carefully watch the heart, the pulse and the blood pressure for signs of digitalis poisoning.

Cumulative action

Tolerance and susceptibility

Intoxication with digitalis

In susceptible subjects digitalis may, when first administered, produce disagreeable symptoms of a nervous character, as palpitation and insomnia, and sometimes symptoms of gastric or intestinal irritation, as nausea or diarrhea. These signs, however, can generally be ignored because they shortly disappear as soon as the organism accustoms itself to the drug. It is claimed that

"Pure Principles" of digitalis

Continued use of digitalis

some of the pure principles of digitalis possess only the cardiac action without the disagreeable local or general effects. All these principles, however, according to the best authorities are so uncertain in their action and vary so much in strength that their use can hardly be recommended excepting tentatively in those cases that display an absolute intolerance against digitalis, and these cases are very rare. (See also page 41.) If no signs of cumulative action or of particular susceptibility to the drug appear within the first two or three weeks of its employment, then there is no valid objection to a continued digitalis therapy, preferably using small doses for indefinite periods of time, even years. This practice, if it can be carried out, is warmly recommended by many authorities and seems to be particularly useful in heart lesions combined with chronic arteritis and arteriosclerosis (see also page 56).

Chronic Digitalis Poisoning

Atropin as an antidote

Occasionally a case of valvular disease comes under observation for the first time with a very slow and intermittent pulse, great muscular weakness, gastric and cerebral symptoms; if on inquiry it is found that such a patient has been taking digitalis for a long time it is always well to tentatively stop or greatly reduce the use of the drug in order to rule out the possiblity of chronic digitalis intoxication. If the heart is alarmingly slow one two-hundredth of a grain of atropine, hypodermically, should be given until the toxic digitalis effect wears off.

Contra-indications

Care in using digitalis in aortic disease

Digitalis is contra-indicated in any case of failing compensation in which the heart muscle has begun to degenerate, especially in advanced myocarditis and fatty heart, as here the heart cannot react to the drug; in fact, by increasing the blood pressure digitalis may seriously embarrass a heart with a weak musculature and cause disagreeable or dangerous complications. For this reason the drug is less useful in aortic insufficiency than in other, especially mitral, valvular diseases, because aortic insufficiency rarely becomes decompensated until extensive degeneration of the left ventricle has occurred. This is due to the fact that the walls of the left ventricle are capable of undergoing enormous hypertrophy before they begin to fail, whereas, the right ventricle succumbs much sooner to overstrain; as a result mitral lesions and lesions of the valves of the right heart produce failure of compensation much sooner than aortic lesions, and often at a time when the walls of the left ventricle are still intact, capable of hypertrophy and susceptible to the action of digitalis. For this reason digitalis should be given with the greatest care in diseases of the aortic valves and only after the absence of myocarditis has, so far as that is possible, been established. In fact, digitalis may be used occasionally as a valuable diagnostic aid for detecting the presence of myocarditis. For degeneration of the heart muscle may be assumed if a digitalis effect, i. e., slowing of the heart beat, an increase of the pulse-tension and impulse, with a forcible apex beat and increased diuresis, do not appear within two or three days after the administration of the drug. In such cases, of course, it is very bad practice to continue with the use of digitalis.

Digitalis in the diagnosis of myocarditis

Another contra-indication to the use of digitalis is extensive atheroma or fragility of the arterial walls, for here the increased pressure may lead to rupture of the vessel walls. Strophanthus should be the remedy of choice in these cases, because it acts as a heart tonic without causing so great a rise of the blood pressure as digitalis. If it becomes necessary to give a heart tonic in such cases it is best, however, to use digitalis or strophanthus in combination with drugs like nitroglycerin or nitrites that can lower the blood pressure; remembering always that the effect of the nitrites becomes manifest much more rapidly than the effect of digitalis, so that the nitrites should be given several hours after the digitalis; and that the effect of nitroglycerin is very short so that it should be given in frequently repeated small doses, several hours after the digitalis has been taken.

Digitalis and strophanthus in atheroma

Digitalis with nitroglycerin and nitrites

Preparations of digitalis

Of the many preparations of digitalis, the infusion and the tincture are, from a practical point of view, at least, the best. The infusion made from the leaves (that should preferably be cut into small pieces and not powdered) should always be fresh. It should be given in doses of from one to two fluid drachms (4 to 8 cc.) according to the requirements of the case. The alcoholic tincture of digitalis is of more uncertain composition and strength than the infusion; nevertheless, in the great majority of cases, it will be found to be efficacious. The proper dose is from five to fifteen drops (0.3 to 1 cc.) three times a day.

Occasionally it becomes necessary in patients who do not react properly to the infusion or tincture to give digitalis in the form of the powdered leaves in doses from one to four grains (0.05 to 0.2 gm.), either in a capsule with sugar of milk or in a pill. This preparation, however, often produces irritation of the stomach, which is especially the case among patients with venous stasis in the gastric veins due to heart disease, i. e., with congestive catarrh of the stomach. Here small quantities of the infusion, diluted with milk and administered ice cold, are frequently well borne.

Digitalis by rectum and hypodermically

When the stomach will not tolerate digitalis the drug may be administered in the form of an enema and the infusion can be used for this purpose. Such a clysma, preceded by a cleansing enema, may be given two or three times a day. Occasionally the administration of digitalis leaves in suppositories fulfills a useful purpose. The hypodermic administration of digitalis is usually very disagreeable, because digitalis exercises a local irritant action and the injection of the drug under the skin is usually painful.

"Pure principles" of digitalis

The chief glucosides of digitalis, viz., digitoxin, digitophyllin, digitalin and digitalien are all extensively used and abundant literature has appeared on the subject. So far, however, I have found it unnecessary, in the great majority of cases, to have recourse to these preparations, especially as their strength and efficacy are usually uncertain; and, old fashioned as it may appear, I give the infusion of digitalis, described above, and the powdered leaves, the preference over all other digitalis preparations.

The effect of digitalis may occasionally be enforced by restricting the liquid intake or by sweating, or both. Alcohol, given half an hour before the digitalis, also makes the latter more effective.

Brief mention may be made of certain other heart tonics that should occasionally be used, either if digitalis is not well borne by the patient or if a cumulative effect appears; the most useful among these in my experience are strophanthus, convallaria, adonis vernalis and caffein.

Strophanthus

Strophanthus, like digitalis, strengthens the action of the heart muscle and slows the pulse, it also raises the arterial blood pressure, but not to the same degree as digitalis, nor does it possess the same diuretic strength. It may, therefore, be used to advantage in place of digitalis in cases of valvular heart disease with arteritis. The chief advantage it possesses over digitalis is that it does not have a cumulative action, so that this drug can always be continued with safety for long periods of time. It seems that strophanthus is more irritating to the kidneys, however, than digitalis, so that, in cases of cardiac disease complicated with nephritis, especially in Bright's disease, the drug should be administered with care. The best mode of administering strophanthus is in the form of the tincture, in doses of five to fifteen drops, three or four times a day. It may also be given in the form of strophanthin, hypodermically, in doses of one one-hundred-and-fiftieth to one-fiftieth of a grain (0.0006 to 0.0012 gm.).

Convallaria

Convallaria retards the heart's action, increases the arterial tension and possesses some diuretic power. It is not cumulative in its action and never irritates the stomach; occasionally it even seems to stimulate the appetite. Convallaria is usually given in the form of the alcoholic tincture (five to ten drops) or the fresh watery extract (four to eight drops).

Adonis vernalis

Adonis vernalis increases the arterial pressure, strengthens and slows the heart beat. On account of its great blood pressure raising power it acts very well as a diuretic when the kidneys are inactive and it is especially useful, therefore, in cardiac dropsy. In cases of interstitial nephritis, however, in which the blood pressure is already high, or in arterio-sclerosis complicated with heart lesions, the drug should be used with great care. It is best given in the form of the fresh infusion, one to four drachms (4 to 16 cc.).

Caffein

Caffein strengthens the heart muscle, raises the peripheral blood pressure and increases diuresis, not, however, by its blood pressure raising power but by a specific action upon the renal epithelium. This drug, too, should never be given when the peripheral blood pressure is high, nor should it be given to very excitable individuals, nor to alcoholics on account of its well known action upon the higher cerebral centers. It not infrequently produces insomnia, and occasionally hallucinations and delirium. It is particularly valuable as a substitute for digitalis and the other heart tonics that exercise their effect directly upon the heart muscle, in cases in which the latter is beginning to degenerate, because caffein presumably manifests its effect not upon the heart muscle directly but upon the nervous apparatus governing the heart beat.

The best preparation is caffein citrate, which may be given in doses of two to eight grains (0.1 to 0.5 gm.), or caffein may be administered hypodermically in combination with sodium salicylate or benzoate, the latter salts forming double compounds with caffein and preventing its decomposition with water.

The drug should be given two or three times a day in the following solution:

℞

Salicylate of soda,	30 gm.
Caffein,	40 gm.
Water,	60 cc.
M.	

Dose for hypodermic use, ten drops; or

℞

Caffein,	2.5 gm.
Sodium benzoate,	3.0 gm.
Distilled water,	10 cc.

M. Sig. 1 cc. hypodermically.

—(Tanret.)

Of this solution each cubic centimeter contains four grains (0.25 gm.) of caffein.

Theobromin

Theobromin, in capsule, in doses of eight grains (0.5 gm.) three times a day, or in solution with a little salicylate of soda; or diuretin, in the same dose; may also be given in place of caffein or its citrate.

Strychnia

Strychnia may also occasionally be used in small doses, one-hundredth to one-thirtieth grain (0.0006 to 0.002 gm.) to slow the heart and raise the blood pressure in failing compensation; it acts chiefly upon the vaso-motor center in the medulla and the general nervous system. It slows the heart beat by its stimulating effect upon the inhibitory centre. It should never be used as a heart tonic when the arterial tension is high.

Analeptics

Camphor
Ether
Ammonia

In extreme cases of cardiac failure in which no time is given to gradually strengthen the heart by the use of heart tonics, it becomes necessary to have recourse to analeptics, as an emergency measure. Chief among these are camphor, ether and ammonia. The clinical indications for the use of these remedies are a weak apex beat, a feeble heart action, a great reduction in the force of the radial pulse or its complete disappearance, coldness and lividity of the extremities and collapse.

Brandy
Champagne
Coffee

In such a condition, brandy or champagne and hot coffee may be administered, but camphor is the remedy par excellence, either alone or as spirits of camphor twenty to thirty drops, or in combination with digitalis, thus:

℞

Camphor,	1 gr. (0.05 gm.).
Powdered digitalis leaves,	2 gr. (0.1 gm.).

For it possesses the power to excite the nervous system and to rapidly produce acceleration and increased strength of the heart's action. In an emergency camphor may be given hypodermically in 10 per cent. solution in ether or in sterile olive oil, twenty to thirty drops at a time.

Indications for the use of ether and camphor and ammonia

Ether, or "Hoffman's Anodyne" (Spir. Ætheris Comp.), a teaspoonful on sugar, or ether alone, hypodermically, are also useful. Ether acts still more rapidly than camphor, and whenever it is desired to produce a very quick effect, ether should first be given and an injection of camphorated oil (see above) afterwards; or camphorated oil in ether, one part of ether to two of the oil, may be administered in the dose of two or three hypodermic syringes. Ammonia, in the form of the aromatic spirits of ammonia, in the dose of fifteen to sixty minims (1 to 4 cc.), frequently repeated, may also be employed. Suprarenalin, finally, hypodermically, in the dose of one-twentieth to one-tenth of a grain (0.006 to 0.003 gm.) is also a useful emergency medicine.

SYMPTOMATIC TREATMENT OF STASIS IN DIFFERENT ORGANS DUE TO DECOMPENSATED VALVULAR LESIONS.

In advanced degrees of failing compensation venous stasis occurs in different organs of the body; and while the treatment of the symptoms produced by this passive congestion, notably in the brain, the lungs, the liver, the kidneys and the gastro-intestinal tract, is essentially synonymous with treatment directed towards improving the general heart action, as described in previous paragraphs, it occasionally becomes necessary in addition to relieve some of the most urgent symptoms that follow the congestion of these parts of the body.

Insomnia Irritability Psychoses

Cheyne-Stokes breathing

Stupor and Somnolence

Passive Hyperemia of the Brain. Passive hyperemia of the brain is one of the most frequent and one of the most distressing consequences of broken compensation. In mild degrees the chief symptoms are insomnia and general irritability, occasionally assuming the characteristics of monomanias or of other psychoses. As the medulla is, at the same time, usually in a state of congestion, respiration may become irregular and the Cheyne-Stokes type of breathing be produced. In late stages of failing compensation chronic venous congestion of the brain produces stupor and somnolence.

Treatment of insomnia

Dangers of chloral and opium

If these symptoms do not readily yield to cardio-tonic medication, then recourse must be had to remedies that control the nervous phenomena, especially the insomnia. In selecting remedies for this purpose among the numerous hypnotics and narcotics that we possess, the impaired condition of the heart must always be taken into consideration. For this reason chloral, which is deservedly one of the most popular hypnotics, cannot be used, for chloral exercises a depressing effect upon the cardiac muscle and the muscles of the blood vessels and also produces paresis of the vaso-motor centres. It acts, in this respect, similarly to chloroform. Moreover, chloral is particularly contra-indicated in this form of insomnia because it produces congestion of the peripheral organs, including the brain, and this is precisely what we are attempting to counteract. The same objection applies to the use of opium and its alkaloids, for they too reduce the tone of the vaso-motor centres and the peripheral blood pressure, thus causing dilatation of the blood vessels and cerebral congestion.

Bromides

The most useful drugs in the treatment of this form of insomnia are the bromides, for they quiet the sensibility of the whole nervous system, and in particular of the special senses, and hence enable the patient to go to sleep, simply because external influences cannot stimulate the over-irritable brain. It has been claimed, moreover, that the bromides produce a distinct anemia of the brain, and that this property can be used to counteract congestion. As a matter of fact, it has been shown by recent investigations that the anemia of the brain found in animals that were killed after having taken large doses of bromides, is no more intense than that found in animals killed when they were asleep; so that the cerebral anemia observed after the administration of bromides must be considered due to the sleep, and the sleep not due to the cerebral anemia.

Bromide of potash

Bromide of soda

The bromide of potassium should never be given in cerebral congestion due to valvular heart lesions, because large doses of potassium undoubtedly weaken the heart and reduce the blood pressure. The bromide of sodium produces less gastric irritation than the bromide of potassium; this drug should therefore be given, preferably in milk and in two divided doses of fifteen grains each, the one about three hours before retiring and the other just before going to bed. It will be found that after a few days' treatment the patients will react more rapidly to smaller doses than in the beginning.

Next in importance to the bromides are sulphonal and its congener, paraldehyde, and a group of drugs that are related to chloral but do not possess the depressing action of this remedy upon the heart, viz., chloralamid, chloralose, chloretone, and veronal.

Sulphonal

The continued use of sulphonal, however, is fraught with some danger and it should be employed with care in heart cases; moreover, it does not seem to act as energetically in cases of failing compensation as otherwise. In giving sulphonal the urine should be carefully inspected. If it assumes a peculiar burgundy-red color the administration of the drug should immediately be stopped, for sulphonal, in persons who possess a peculiar idiosyncrasy to the drug, occasionally produces hematoporhyrinuria.* It should be given in doses of from fifteen to thirty grains (1 to 2 gm.), in some hot beverage, about three or

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*See Tyson and Croftan: *Trans. Ass'n. Am. Phys.* 1901.

four hours before going to bed. As sulphonal is excreted very slowly it will be found that the dose can gradually be reduced.

Trional

Trional acts more rapidly than sulphonal, and usually produces sleep within an hour. It is given in the same dose as sulphonal, and is particularly efficacious if given in combination with codeine, one-fourth grain (0.015 gm.).

Paraldehyde

Paraldehyde does not influence the heart in any way and produces a very rapid hypnotic effect, the patient usually going to sleep within ten or fifteen minutes. The drug should be given in doses of fifteen to sixty minims (1 to 4 cc.), preferably in brandy and water. As the drug is largely excreted through the lungs, the patients for a day after the use of paraldehyde are apt to complain of a disagreeable odor of the breath, similar to alcohol.

Chloralamid

Chloralamid is a compound of chloral and formamide and decomposes in the stomach with the liberation of formamide, a drug that counteracts the circulatory depression produced by chloral. Its hypnotic effect is very marked. Dose, fifteen to thirty grains (1 to 2 gm.).

Chloralose

Chloralose, a glucoside compound of chloral, does not affect the heart at all and is an excellent hypnotic. It should be given in powder form in capsules containing two to five grains (0.12 to 0.3 gm.) of the drug. This dose may be increased to two or three powders on succeeding days, if the desired effect is not produced by one powder.

Chloretone

Chloretone does not irritate the stomach, especially in watery solution, nor does it depress the circulation. It usually produces a marked effect in small doses of five to ten grains (0.3 to 0.65 gm.) and may be used as an alternative for some of the other remedies.

Veronal

Veronal, finally, is one of the most useful newer hypnotics in cerebral congestion. It acts exclusively upon the central nervous system, does not depress the heart or circulation, and leaves very slight after-effects. It may be given in doses of five to fifteen grains (0.3 to 1 gm.) in warm water or milk, or in capsule, about an hour and a half to two hours before sleep is to be produced.

Cannabis indica

Of all the other commoner hypnotics that might be used cannabis indica is mentioned merely to be condemned, for it exercises a very deleterious effect upon the heart and circulation and should never be used in sufferers from valvular disease.

Bloodletting

In addition to all these hypnotic and narcotic remedies, blood-letting, either locally or by venesection, is an exceedingly useful measure for combating cerebral hyperemia. Blood may

Leeches

be withdrawn locally, either by the use of leeches or by scarification and cupping. As the latter procedure cannot be applied in blood-letting about the skull, the technique will not be described in this place. Leeches should be applied in cerebral congestion to the mastoid process.

Good leeches should move about freely in water and should contract when touched. To induce the leech to take hold a drop of sugar solution or of milk is placed upon the skin, or, better still, a small incision is made so that a drop of blood oozes out. The skin, of course, should be thoroughly cleansed before the leech is applied. As a rule, the leech is allowed to suck blood until it lets go spontaneously. If it is desired to remove the leech before he has sucked all the blood he can, a little salt may be put upon his tail. If, on the other hand, it is desired to prolong the bleeding after the leech has let go, the wound may be treated with a warm sterile solution of salicylic acid.

Venesection

Venesection usually produces a much more rapid effect and is particularly useful in venous hyperemia of the brain due to valvular disease. By withdrawing enough blood from a vein the heart is at once relieved of a great deal of labor, and resumes, for the time at least, its normal action, especially if venesection is enforced by cardio-tonic medication. Venesection is performed as follows: The arm is compressed above the elbow with a handkerchief or a bandage, so that one of the three large veins on the anterior surface of the fore-arm becomes prominent; the skin is carefully disinfected over the place of incision and the scalpel introduced with the cutting edge forward into the vein. The cut should be made diagonally across the vein for by doing so both the circular and longitudinal muscle fibres of the blood vessel wall are severed, and closure of the incision is thereby facilitated and accelerated. About 3 cc. of blood to each kilo of body weight should be withdrawn, not more. After the desired amount of blood has been allowed to escape the constricting binder is removed and the wound tied up with a small pressure bandage. If the patient should faint during venesection, bleeding should immediately be stopped and the patient placed in a recumbent position, with the head lowered. If the subject is very fat it may be necessary to dissect down to the vein, a little operation that can readily be performed under local anesthesia. Occasionally the median cutaneous nerve is severed during this operation, producing a little pain or tingling along the distribution of this nerve; these symptoms usually disappear within a day or two. Particular care should, of course, be taken neither to wound the posterior wall of the vein nor to sever the artery, and it is always well first to determine the position of the artery and to select that vein for incision which is farthest removed from it. Puncture of a vein with a trocar may also be performed but this procedure is not quite so safe.

Passive hyperemia of the lungs

Cardio-tonic medication

Danger of opium

Tartar emetic

Ipecac

Ammonium chloride

Tolu

Benzoin

Syrup of squills

Passive Hyperemia of the Lungs. Passive hyperemia of the lungs due to valvular disease is very common. As a rule the dyspnea, the bronchitis and the hemoptysis readily disappear if the heart is treated. Occasionally, however, the congestion of the bronchial muscosa becomes chronic and a bronchial catarrh is produced that may call for special attention. Here the same remedies are useful as in other forms of bronchitis, so that I refer for the special treatment of this complication to the Chapter on *Diseases of the Respiratory Organs.* In heart disease, however, certain of our most popular expectorants become dangerous on account of their effect upon the heart; thus tartar emetic and apomorphine should never be used in these cases. Opium, morphine and ipecac should also be given with very great care. The former, because they produce congestion and thereby merely aggravate the pulmonary hyperemia; the latter, because it may produce vomiting and in this way severely strain the cerebral vessels which are congested, and hence may possibly produce cerebral hemorrhage. If the catarrh of the bronchial mucosa is dry and the secretions are expelled with difficulty, ammonium chloride or some of the preparations of benzoin, as syrup of tolu or compound tincture of benzoin, thirty minims to two fluid drachms (2 to 8 cc.) may be given. Codeine or heroin in one-sixteenth to one-eighth grain doses (0.015 to 0.03 gm.), repeated, are very useful in this condition especially for allaying excessive irritation and reducing the cough. The syrup of squills is particularly valuable, for scilla being a member of the digitalis series, possesses a marked cardio-tonic effect; and hence it not only increases the bronchial excretion, promotes better expectoration and relieves the cough, but also supports and stimulates the heart. It may be given conveniently in the form of the syrup of squills in the dose of thirty to forty minims (2 to 3 cc.).

Venesection

In pulmonary and bronchial congestion venesection is again a sovereign remedy; in fact, occasionally, spontaneous bleeding from the lungs is Nature's way of relieving the hyperemia. The treatment of this hemoptysis if it should become severe is chiefly cardio-tonic. Ergot, of all remedies, should never be given (see *Hemoptysis*).

Passive Hyperemia of the Liver. In valvular diseases of the heart, with failing compensation, passive congestion of the liver is particularly liable to occur. First, because the hepatic veins are so near the heart, so that any interference with the entrance of the blood into the right auricle readily becomes manifest in the liver veins; second, because the pressure within the liver veins is naturally very low. For this reason we often encounter cases of valvular disease with only slight disturbances of compensation in which the liver is the first and only organ afflicted with passive hyperemia. Some of these patients actually complain of no symptoms about the heart, and suffer merely from pain in the epigastrium, a feeling of heaviness or pressure in the hepatic region, and gastro-intestinal disorders, all resulting from the impaired circulation in the liver and the enlargement of the organ.

Epigastric pain

Gastro-intestinal disorders

The treatment here, as in other conditions of passive hyperemia due to valvular diseases is primarily cardio-tonic. In addition, however, it may become necessary to institute certain special treatment in order to relieve the symptoms just described.

Counter irritation over the liver

Chief among these is counter-irritation over the liver, either by means of vesication, leeching or cupping. The method of applying leeches has already been described. Cupping is performed as follows: The skin is shaved and thoroughly cleansed. An ordinary cup or the special apparatus that is constructed for the purpose, is warmed and placed upon the skin. Owing to the vacuum created within the cup the cupped area becomes hyperemic and this constitutes an efficient counter irritation. If it is desired to withdraw blood by cupping the surface of the skin should be scarified and the cup applied as above; in this way several ounces of blood can be withdrawn.

Cupping

Ice bag

The ice bag also occasionally affords relief, especially if it is applied intermittently, i. e., left on for one hour and removed for one hour. The ice bag, of course, should never be applied directly to the skin, but a few layers of gauze or a handkerchief must be placed between the skin and the ice bag.

Heat

In other cases heat is more grateful. Mustard plasters and poultices made of bread, linseed, cranberries or oatmeal can also be used to apply heat and at the same time to counter-irritate. Occasionally it is useful to add some narcotic to the poultice, and this can best be done by dipping a small piece of linen into tincture of opium or belladonna and placing it into the material that forms the poultice. A very useful method of applying continuous heat, locally, is to use a thermophor, i. e., an ordinary rubber bag filled with sodium acetate. By leaving this bag in boiling water for ten minutes the acetate is dissolved. The thermophor is then wrapped in a hot cloth and applied to the surface of the body. As the salt crystallizes out again, heat is liberated and, in this way, a temperature of from 40° to 50° C. (105° to 122° F.) can be maintained for several hours.

Plasters and poultices

Thermophor

leeching

Another method is occasionally used in the treatment of hepatic congestion due to cardiac weakness, viz., the withdrawal of blood, preferably by leeches, from the anal region. This empirical method was first described by Sacharjin, and is useful as well in hyperemia of the brain and the spinal cord and in stasis in the portal circulation, as in hemorrhoidal conditions. The leeches may either be applied to the perineum or to the sacral region. If a leech should crawl into the rectum, a solution of common salt (2 to 5 per cent.) should be injected in order to kill the animal.

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In passive hyperemia of the liver the alkaline and saline mineral waters are very useful. Chief among them are the waters of Marienbad, Kissingen and Franzensbad. Bitter waters, especially Hunyadi-Janos, are also useful. If the kidneys are affected, or if there is much anasarca, the taking of these waters is, however, contra-indicated. Cases of hepatic hyperemia are usually benefited by a "cure" in Kissingen or Marienbad and similar watering places, not only because they drink the waters, but also because they are forced to live a more sensible life and are placed upon a strict and rational regime.

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The diet should contain very little carbohydrate food, because starches and sugars always produce a digestive congestion of the liver, an effect that is above all things to be avoided. For the details of the diet in hepatic insufficiency due to stasis, I refer to the Chapter on *Diseases of the Liver*. In cases of passive hyperemia of the liver with renal symptoms, in which the saline and alkaline waters may have to be eschewed, certain vegetable laxatives are useful. Chief among them are rhubarb, aloes, podophyllum, cascara sagrada. Calomel also has its place in this affection. All these remedies are intended to act as laxatives, and their exact administration and dose will be found described in the Section on *Diseases of the Intestine*.

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Passive congestion of the stomach and intestine is a very common and a very disagreeable symptom of cardiac weakness. It may be due either directly to the interference with the venous back-flow from the gastro-intestinal mucosa, or to passive hyperemia in the liver, with resulting stasis in the portal system. In many cases the picture presented is that of a gastro-intestinal catarrh (occasionally with hematemesis, see page 376), and the treatment of this condition differs in no respect from the ordinary treatment of such a catarrh, with this exception, that combined with the usual dietetic and medicinal measures employed for its relief (see page 376), energetic cardio-tonic treatment should be simultaneously instituted. Here one difficulty is encountered, viz., the danger of giving digitalis by mouth, on account of the irritating action that this remedy occasionally exercises upon the stomach. This objection, however, is more theoretically constructed than practically important; for only in rare cases do we find the irritability of the stomach so great that digitalis cannot be given by mouth. If the infusion of digitalis is given in small quantities at a time, and if it is given ice cold, difficulties will rarely be encountered. If necessary, dgitalis can be given in the form of an enema or in a suppository, or, as a last resort, in the form of digitalin, one-sixtieth grain (1 mg.), hypodermically.

Method of giving digitalis

Passive Hyperemia of the Kidneys. Passive hyperemia of the kidneys, finally, aside from cardio-tonic treatment, calls for a careful regulation of the diet. It is important to recognize the character of the renal difficulty, i. e., to decide whether or not there is present a real nephritis or merely stasis in the kidney. The presence of valvular lesions and evidence of embarrassment of the venous circulation in other organs usually decides the question. The urine as a rule is concentrated, owing to a relative increase of urea, uric acid and urinary pigments; hence its specific gravity is high and it has a tendency to precipitate an abundant urate sediment. Its color is usually very dark. There is rarely much albumin. Hyaline casts, in small numbers, are commonly present, also a few leucocytes and an occasional red blood corpuscle. Renal epithelia, granular or blood casts are generally absent.*

Milk diet

In these cases a milk diet is useful. Too much milk should not, however, be ordered, nor should large quantities of milk be given at a time. The milk diet, by leading to the formation of small quantities of irritating urinary end-bodies, spares the kidneys; it also acts to a certain extent as an intestinal antiseptic and hence prevents the formation in the bowel of putrefactive poisons that can irritate the heart and the kidneys; in addition, it possesses diuretic properties which act advantageously by stimulating the kidneys to an increased secretion of water. The only objection to an exclusive milk diet is the danger of flooding the cardio-vascular apparatus with large quantities of water, and hence forcing the heart to perform much labor in pumping the water from the stomach to the emunctories of the body. Consequently the total amount of milk should rarely exceed one quart in the extreme; and a little meat, fats, cereals, fresh fruits and vegetables should be added to the diet in order to make up the nutritive deficit.

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*See Croftan: *"Clinical Urinology."*

TREATMENT OF CARDIAC DROPSY AND EDEMA.

Rest and massage

Mild dropsical swellings about the ankles can usually be promptly relieved by rest in bed, massage and a milk diet. As soon, however, as an accumulation of serum occurs in the serous cavities and the subcutaneous tissues, more active treatment must be instituted. The means at our disposal are stimulation of the action of the sweat glands and the kidneys, and catharsis. If these measures fail, surgical treatment of hydrops must be instituted, either by incision or puncture of the edematous extremities and drainage, or by paracentesis of the dropsical serous cavities.

Diaphoresis

Pilocarpine contra-indicated

The stimulation of the sweat glands should be brought about preferably by physical means; for we know of only one remedy that really possesses the power of stimulating the sweat glands, viz., jaborandi and its alkaloid, pilocarpine; and unfortunately, this drug is distinctly contra-indicated in valvular diseases of the heart, for it depresses the heart decidedly, slows its action and appreciably reduces arterial tension.

Hot air and steam sweats

Inasmuch as hot bathing is always dangerous in heart diseases, for reasons that have been described (see page 25), recourse must be had to sweating by the use of hot air or steam. In order to do this at home the patient should be seated upon a chair, a woolen blanket fastened around his neck and draped in such a way about the person of the patient that it covers his whole body and the chair, i. e., forms a tent with the head protruding above. By placing a lamp underneath the chair a profuse sweat can soon be induced. Sweating in bed can be produced in the same way by arranging a frame work over the patient and covering this with blankets. At the side of the bed is placed a lamp and over the lamp a metal funnel to which is attached a rubber tube which conducts hot air underneath the blanket, care being exercised, of course, that the patient is not burned by the hot air. If it is desired to give the patient a steam bath, the steam from a kettle of hot water may be conducted under the blanket tent by means of the same funnel and tube arrangement.

In all of these procedures the patient's head should be kept cool with cold baths or an ice bag. The hot air or steam sweating may be kept up for ten or fifteen minutes with safety. At the end of the sweating the patient should be wrapped in blankets and allowed to remain quiet for half an hour; at the end of this time the surface of the body may to advantage be bathed in lukewarm water, dried with a rough towel and rubbed with alcohol.

Heart Tonics
Diuresis

Theobromin diuretin

Among the diuretics that can be used for the relief of cardiac dropsy the heart tonics (digitalis and its congeners), and caffein, given either alone or combined, are the most useful remedies. To the caffein group belongs also the very popular medicine, theobromin, and its compound with sodium salicylate, diuretin. All these caffein derivatives are renal diuretics and act by exciting the renal epithelia. Diuretin is best administered in powder form, in the dose of about ten to twenty grains (0.65 to 1.3 gm.) three or four times a day. A useful prescription in cardiac dropsy consequently is:

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Powdered digitalis leaves,	0.1 gm.
Diuretin,	1.0 gm.
Sugar of milk,	0.3 gm.

M. Sig. One such powder three or four times a day.

Calomel

Diuretic teas

As the hydrochloric acid of the stomach seems to interfere with the absorption of diuretin this drug can advantageously be given in combination with sodium bicarbonate in a little milk. If diuretin fails to increase the flow of urine after two or three days, its use had better be discontinued and recourse had to some other remedy, notably calomel, in doses of two grains (0.1 gm.) repeated five to ten times a day, for several days in succession. This treatment may be repeated at intervals of a week or ten days. The diuretic effect of this drug is very striking. It is contra-indicated, however, if nephritis exists, or if there is a severe anemia or much gastro-intestinal trouble. Salivation should be forestalled by the frequent use of a dilute solution of chlorate of potash or tannic acid as a mouth wash. (See *Stomatitis.*) If salivation appears, nevertheless, calomel should be stopped at once. To counteract the irritative diarrhea five grains (0.3 gm.) of powdered opium may be given daily. Diuretic teas were formerly very popular but they act presumably more through the hot water they contain than from any specific effect; as they must be taken in large quantities to be effective and as abundant water drinking is contra-indicated, their use cannot be recommended.

Sugar of milk

Sugar of milk may also be utilized as a diuretic in these cases. Inasmuch as these patients are, as a rule, living on a diet consisting largely of milk this effect is produced anyhow; the addition of milk sugar in varying doses to the milk, however, frequently enforces the diuretic effect of the latter. Other sugars seem to possess a similar diuretic influence and the administration of a solution of dextrose is occasionally very useful in increasing the flow of urine.

Catharsis

Saline cathartics

Three classes of purgatives or hydragogue cathartics may be used to advantage in the treatment of renal dropsy, viz., saline cathartics, vegetable purgatives and mercurial purgatives. The chief saline cathartics are the sulphate of sodium (Glauber salt), the sulphate of magnesium (Epsom salt), the double tartrate of sodium and potassium (Rochelle salt) and the citrate of potassium and magnesium. These salines, in contradistinction to the vegetable and mercurial purgatives, do not irritate the intestinal wall, but act chiefly by increasing the molecular concentration (i. e., the osmostic pressure) within the intestine, and hence draw water from the serum into the bowel. In this way the blood becomes more concentrated and in its turn draws water from the tissues; the saline cathartics also stimulate the peristaltic movement of the bowel through their bulk and in this way hasten the propulsion onward of the bowel contents.

Sodium sulphate may be given in doses of thirty grains to an ounce (2 to 30 gm.). The sulphate of magnesium in the same quantities. Rochelle salts in doses of about one-fourth to one-half an ounce (8 to 16 gm.), and the citrate of potassium and magnesium in doses of fifteen to fifty grains (1 to 3 gm.). In addition there are a number of pleasant effervescent mixtures that may be given. The concentration of the solutions of these different saline cathartics is very important. They should not be more concentrated than ten per cent. The disagreeable taste, especially of the magnesium salts, can often be disguised by the addition of a little sugar or by giving the salts in milk.

Vegetable purgatives

Croton oil

Jalap
Colocynth
Podophyllum
Elaterium

Among the vegetable purgatives the oils, castor oil and croton oil, have a very subordinate importance in the treatment of cardiac dropsies, because they do not produce a sufficiently active purgation unless given in doses so large as to produce serious irritation of the bowel wall. This applies particularly to croton oil. Inasmuch as the mucosa is generally in a state of passive hyperemia in cases of valvular heart lesions that have progressed to the stage of dropsy, it is particularly important not to give drugs that can irritate the bowel wall. The rhubarb, senna, aloes group are also little used in the treatment of cardiac dropsy; first, because they are all irritating and, second, because their action is relatively mild. The chief vegetable purgatives, therefore, that we must use are jalap and colocynth, podophyllum and elaterium. Of all these jalap is the most deservedly popular. Inasmuch as this drug occasionally produces nausea, vomiting and colic, it is best to combine it with hyoscine or belladonna which counteract this effect. The following official preparations of the U. S. P. are all useful: The Compound Cathartic Pill containing colocynth, jalap, gamboge and calomel, given three at a time. The Vegetable Cathartic Pill containing colocynth, jalap, podophyllum, hyoscyamus and peppermint oil, given in similar doses as the above. The Compound Elaterin Powder containing one part of elaterin in thirty-nine parts of milk sugar, and given in doses of one to four grains (0.06 to 0.25), and finally, the Pill of Podophyllin, Belladonna and Capsicum. The appearance of blood or mucus in the stools, or other signs of gastric or intestinal irritation, contra-indicate the continuation of these remedies.

Surgical treatment

If all these medicinal measures, with sweating by hot air or steam, fail to relieve the dropsy, then recourse must be had to what may be called the surgical treatment of cardiac hydrops.

The surgical relief of hydrops or anasarca of the lower extremities is more than a palliative measure, for, in many cases it will be found that the withdrawal of the fluid from the serous cavities or limbs, when combined with active cardio-tonic medication, enables the heart to regain its tone and occasionally aids in the re-establishment of compensation. Unfortunately this happy result is only rarely seen. The simplest and the safest way of removing the dropsical swelling of the extremities is to make an incision. The patient should be ordered to sit upright, or, at least, to keep the legs in a dependent position for several hours before the incision is made. The feet and legs are carefully cleansed with soap and water and the skin rendered aseptic with bichloride solution, alcohol and ether. The best place for the incision is the external margin of the foot, below the external malleolus, or the dorsum of the foot. The incision should be at least an inch or two long and should be carried completely through the skin. By placing a cloth, wrung out of very hot water, over the wound immediately after the incision is made, bleeding can be stopped. The wound is then covered with a piece of bichloride gauze, the feet wrapped in cotton and placed in a pan containing a litle dilute carbolic acid or bichloride solution. As soon as the bulk of the fluid is drained off the wound usually closes if a simple compression bandage is applied.

Incision

Southey trocars

A second method is the so-called Southey method, which consists in the insertion of a number of trocars deep into the subcutaneous tissues of the leg. That this little operation should be performed with all aseptic precautions need hardly be emphasized. To the protruding ends of the little trocars are attached rubber tubes upon which suction may be advantageously exercised in the beginning in order to start the flow of the serum through the tube; the region around the trocar may be painted with iodoform collodion or may be covered with antiseptic gauze. After the fluid is drained off and the canulæ are withdrawn, the little holes can be closed with iodoform collodion or gauze. This method is not so safe as the incision method, nor does it produce the desired effect so rapidly. The method by incision, moreover, is not so painful as the insertion of trocars nor is the danger of infection of course so great from an open incised wound as from a semi-occluded punctured wound.

Scarification and cupping

The method finally of scarifying the tissues and cupping through a funnel that carries off the dropsical fluids and the blood is less practical and not as efficacious as incision or trocar drainage. In draining off large quantities of anasarca fluid cerebral anemia occasionally develops, so that the patient becomes nauseated and dizzy and finally faints. When this occurs drainage should at once be interrupted, the patient's head lowered and ether or camphor administered hypodermically.

Paracentesis of the Abdomen

Paracentesis for the removal of ascitic fluids is always indicated when the accumulated fluid mechanically presses the diaphragm upward and in this way interferes with respiration and the action of the heart, or if it compresses the stomach and bowels in such a way as to interfere with digestion.

Occasionally paracentesis of the abdomen becomes necessary even without the appearance of compression symptoms in the thorax, without very considerable interference with the heart's action, and without the presence of much edema in other parts of the body. One is often surprised to find such an abdomen full of fluid in cases of valvular lesions that are not in an advanced degree of decompensation. Here the development of the ascites is due to portal stasis superinduced by the existence of a "nutmeg" liver ("heart disease liver," cardiac cirrhosis) and compression of branches of the portal vein within the atrophied organ.

When performing paracentesis of the abdomen cardiac stimulants should always be held in readiness in order to counteract the possible occurrence of cerebral anemia that may follow the sudden engorgement of the abdominal veins with blood when the fluid is withdrawn and the intra-abdominal pressure is relieved. The tapping can be made with an ordinary trocar and can be performed with the patient either in a recumbent or in a sitting position. The skin should be thoroughly cleansed with soap and water, bichloride solution, ether and alcohol, and when making the puncture care should be taken to avoid superficial blood vessels. If the abdominal wall is very edematous, the local anarsaca should first be removed by massage. It is usually a good plan to make a small incision before inserting the trocar, as the little operation is less painful if this is done. The entrance of the trocar into the abdominal cavity is readily recognized by a certain "give," and there is no danger of wounding the bowel in simple ascites. As soon as the bulk of the fluid has been tapped off, the bowel is usually felt to lightly touch the trocar point and the flow stops. This is the signal for withdrawing the needle. The wound is covered with a small piece of iodoform gauze and the latter attached to the skin with iodoform collodion. No other dressing is as a rule needed. The patient should be instructed to lie for half an hour or so on the side opposite the puncture. This treatment is, as a rule, merely palliative and has to be repeated; the exceptions to this rule are the cases of hepatic ascites mentioned above, in which the withdrawal of ascitic fluid frequently exercises an effect that is very long lasting.

Paracentesis of the pleural cavity and the pericardium

Paracentesis of the pleural cavity is very rarely necessary in heart lesions. It is always an emergency measure and a last means to be resorted to only when the accumulation of fluid in the pleura is very great and respiration and the action of the heart are interfered with to such extent that death would occur unless the fluid were withdrawn. The technique of this procedure will be found discussed under *Pleuritis*. Paracentesis of the pericardium is probably never indicated in cardiac dropsy; the technique is discussed in the part on *Pericarditis* with effusion.

MYOCARDITIS AND FATTY DEGENERATION OF THE HEART.

Causal and prophylactic treatment

Myocarditis is generally secondary to a variety of primary disorders of an infectious or toxic character. It is a common terminal condition in diseases of the coronary arteries and failing compensation. Cachectic conditions, chronic anemias, acute articular rheumatism and malnutrition very often lead to myocardial changes; finally, it is a senile change. Causal and prophylactic treatment is throughout synonymous with the treatment of the underlying disorder.

Recognition

The recognition of myocarditis is never easy. The cardinal symptoms are a weak first sound at the apex, a weak second aortic sound, occasionally a fetal heart beat rhythm (embryocardia), low blood pressure, a slow, small, feeble, soft, compressible pulse. Moreover, a heart with myocarditis generally fails to react to digitalis, so that the diagnosis can occasionally be made if the heart does not become slower, the blood pressure higher and diuresis increased after the administration of an appropriate dose of digitalis.

Types

The degeneration of the myocardium generally assumes a fatty type. In treating established myocarditis it is important to distinguish between fatty infiltration of the heart muscle, due to degeneration of the muscle fibres, and fatty infiltration due to the interposition of fat between intact muscle bundles. The latter condition is generally combined with fatty overgrowth about the heart and is in most cases a symptom of a general obesity. The symptoms of true degeneration of the heart muscle and of fatty heart (cor adiposum) are very similar, but the treatment is, as a rule, different.

Fatty infiltration and fatty degeneration

Diet in fat heart

In the former instance the diet should be arranged in such a way as to reduce general obesity. The details are given in the Chapter on *Disorders of Metabolism.* Oertel's Terrain cure (see page 23) is the most valuable means, however, for treating patients with cor adiposum. This exercise treatment stimulates oxidation, gradually exercises the heart muscle and hence helps restore its tone by favoring the back-flow from the periphery towards the heart, while at the same time stimulating the heart to increased contractions. This treatment, of course, can only be carried out in resorts that are arranged for such purpose. In myocarditis consecutive to coronary or valvular disease with failing compensation it should, however, never be employed.

In early stages of myocarditis the same principles should obtain as in the treatment of valvular disease of the heart with failing compensation, and of endocarditis. (For the details of this treatment I refer to the respective sections.)

Acute myocarditis

Acute myocarditis, when fully developed, should be treated by rest, physical and mental, a bland, non-irritating diet and counter-irritation over the precordium by means of cold, leeches, cupping or plasters. Digitalis and other cardiac tonics should always be used with great care in acute myocarditis, especially if the digitalis effect does not become apparent within two or three days after the commencement of its administration. In emergencies analeptics may have to be given to save life (camphor, ether, ammonia, (see page 32).

Myocarditis in acute articular rheumatism

In myocarditis developing in the course of acute articular rheumatism, salicylate of soda should be discontinued at once and quinine and alkalies administered instead, the former as quinine sulphate in doses of three to five grains (0.2 to 0.3

gm.); the latter preferably as sodium bicarbonate, in doses of fifteen to thirty grains (1 to 2 gm.).

Chronic myocarditis

In chronic myocarditis due to fibroid degeneration and atrophy of the heart muscle, restitution to normal conditions is impossible and treatment is altogether palliative. All violent exercise, mental over-strain or worry, and emotional shocks should be carefully avoided. Sexual intercourse should be absolutely forbidden. The general health should be built up by a nutritious diet appropriate to the state of the digestive organs. Tea, coffee, alcohol and tobacco should be interdicted. A course of arsenic often acts as an effective general tonic. Fowler's solution should be given, beginning with two or three drops a day and gradually increasing the dose until twenty or thirty drops a day are taken, and then slowly reducing the dose until two or three drops are again reached; such a course may be repeated two or three times. Constipation and flatulency should be counteracted and anemia treated by appropriate remedies (see index). Cardiac tonics should be given, if at all, under careful supervision, and the same general rules should be followed as in the treatment of valvular diseases during the stage of compensation.

ACUTE ENDOCARDITIS.

Acute endocarditis may appear as a primary affection, but it usually complicates a great variety of general diseases, chief among them acute articular rheumatism, scarlet fever, pneumonia, chorea, septicemia, erysipelas and gonorrhea. Syphilis and all cachectic states also occasionally determine inflammation of the endocardium.

Prophylaxis

Prophylactic treatment is identical with the treatment of the underlying disorders. Absolute rest in bed, and cold to the precordium, are the only measures that can be adopted to reduce the liability of the endocardium to involvement in the disease process. Rest, above all, should be enforced in acute articular rheumatism, gonorrheal arthritis and chorea, even if the general manifestations are slight, for, in the mildest case the liability of the endocardium to involvement should be remembered and absolute rest insisted upon. In many cases of tonsillitis, too, the heart should be repeatedly examined and upon the appearance of the slightest signs of endocarditis the patient at once put to bed.

Septic form

In septic, scil. ulcerative endocarditis occurring in the course of septicemia and puerperal pyemia, orthocresol, quinine and mercury bichlorid have been recommended. Very little at best can, however, be expected from any medicine in this disease. In view of the serious and usually hopeless character of this malignant form of endocarditis these remedies should, however, be tried, for it is always better at least to try a medicine that can do no harm than to stand by without doing anything and lazily contemplate the death of the patient. The use of carbolic acid subcutaneously and intravenously will be found discussed at length in the Chapter on *Malaria*. Quinine and mercury bichloride may be given combined, the former as the sulphate or the hydrochlorate, in doses of from five to fifteen grains (0.3 to 1 gm.); the latter in the dose of one-thirty-second to one-sixth grain (0.002 to 0.01 gm.) in pill or capsule, preferably with milk.

Syphilitic form

In the syphilitic form of endocarditis the ordinary antiluetic medication (see Section *Syphilis*) must be used. In the rheumatic form salicylates combined with alkalies, or the alkaline-quinine treatment should be administered, preferably the latter in view of the possibility of myocardial complications in which salicylates do harm (see page 48). Salicylic medication, moreover, seems to exercise a less profound effect in rheumatic disorders upon the endocardium (and pericardium) than upon the serous membranes lining the joints. For the mode of administering salicylates, alkalies and quinine in rheumatic endocarditis, I refer to the Section on *Acute Articular Rheumatism*.

Rheumatic form

Rest

Counter-irritation

With endocarditic inflammation once fully established the treatment varies according to the stage of the disease. Throughout the course of the endocarditis absolute rest in bed should be enforced; cold should be applied to the precordium, either by means of a Leiter coil or an ice bag, either continuously or with interruptions, the latter plan being generally preferable and less disagreeable to the patient. Early in the affection cupping, leeching or counter-irritation with iodine, blisters or plasters over the heart can do no harm.

Medicamentous treatment

Aconite

Digitalis

The medicamentous treatment in the beginning must be chiefly directed towards maintaining the tone of the heart and preventing cardiac insufficiency. Here the tincture of aconite, one to five drops given every few hours, is the best remedy, especially in sthenic cases when the heart beats fast and strong; for this drug quiets the heart, slows its action and reduces the blood pressure, in other words, relieves the heart of much strain and reduces its labor. Later, when the heart is beginning to fail and its action is accelerated but weak and irregular, and stasis or hydrops in different organs begin to appear, then digitalis should be used (see page 28). In early stages of the disease, therefore, aconite is the proper remedy; in later stages digitalis. It is clear that occasionally these drugs may have to be given together.

Absorption of the exudate

No drug that we know of can produce absorption of the vegetations on the valves of the heart after they have once formed. Chloride of ammonia, sodium carbonate and the iodides of soda and potash have all been recommended for this purpose; but the claims for these remedies have never been substantiated clinically, so that these drugs had better not be given in endocarditis, especially as their administration may do more harm than good by irritating the stomach and interfering wih digestion. Iodides have a place in chronic endocarditis, not on account of their effect upon the vegetations but for their effect on the blood pressure (see page 55).

Diet

The diet in acute endocarditis should consist largely of milk, gruels and broths, with the additions of a little toast, a few crackers, a little fresh fruit and vegetables.

During convalescence, in view of the valvular heart lesions that usually remain, the treatment becomes the same as in compensated or decompensated valvular lesions of the heart and I refer to those chapters for the details.

PERICARDITIS.

Cold
Quinine
Morphine

The treatment of pericarditis varies according to the stage of the disease and the character of the effusion or exudate in the pericardium. Upon the appearance of the first symptoms of pericarditis absolute rest in bed, with an ice bag or a Leiter coil over the heart, should be enforced; five to fifteen grains (0.3 to 1 gm.) of quinine should be administered in divided doses; and if the pain is very severe a fourth of a grain of morphine hypodermically, two or three times a day for two or three days. If the case cannot bear cold to the precordium, a warm Priessnitz compress should be applied, consisting of a linen cloth wrung out of hot water and covered with several layers of flannel. This should be left on undisturbed for several hours and then renewed. Oatmeal or bread poultices, belladonna or veratrine plasters or ointments also often relieve the pain. Cold or heat or counter-irritants applied in this way to the precordium produce dilatation of the cutaneous blood vessels of this area and hence relieve the congestion in the underlying pericardial sac; they also reflexly deplete the pericardium. These measures usually promptly relieve at least the disagreeable subjective sensations of the patient.

Warm Priessnitz compress

Plasters and poultices

Diet

The diet in the early stage should be non-irritating and should consist of liquids, milk, gruels, possibly with the addition of a little toast, bread and butter or some stewed fruit or vegetables.

No medicines can act directly curatively. In the tuberculous variety ideal hygienic conditions and a proper diet, as described in the Chapter on *Tuberculosis* should be insisted upon.

In the rheumatic forms of pericarditis an alkaline salicylate treatment (see page 550) may occasionally aid in preventing pericarditis, but upon the establishment of pericardial inflammation the use of salicylates should be discontinued and quinine and alkalies (see page 552) given instead.

Digitalis

In early stages if the patient is not weakened by disease, and if the heart's action is rapid and tumultuous, aconite is the best remedy, preferably given in doses of from one to five drops of a good tincture, every two or three hours. Digitalis should be given with care, especially in pericarditis with large amounts of effusion, because digitalis prolongs the diastolic dilatation of the auricles and this particular action of the heart is always rendered difficult when pressure is exercised upon it from without, as, for instance, by a large pericardial exudate. If digitalis is administered at all the pulse should be carefully watched. In very advanced degrees of pericarditis, in which the heart's action becomes seriously impaired from excessive labor imposed upon the organ, digitalis and occasionally analeptics must be employed as an emergency measure in order to save life. If it becomes very slow, 65 beats to the minute or below, or markedly dicrotic, digitalis should be discontinued at once. Digitalis, however, has a place in the treatment of early stages of pericarditis without much effusion, for here it is very important that the heart's action should remain as energetic as possible, because in this way the formation of fibrinous adhesions may be rendered difficult and possibly prevented.

Diuresis and catharsis

The treatment of large pericardial exudates that form after the acute stage of the disease is over, or of pericarditis that sets in with a large serous exudate, must be considered separately. Here an energetic diuretic treatment, as discussed under the heading of cardiac dropsies (see page 42), combined with catharsis, may be employed with the object of ridding the organism of much water through the kidneys and bowel, thus concentrating the blood and consequently promoting the reabsorption of the pericardial exudate. Only occasionally, however, can pericardial fluid be made to disappear in this way.

Paracentesis of the pericardium and pericardiotomy

In case medical measures fail, then surgical treatment must be instituted, consisting either in paracentesis of the pericardium or pericardiotomy. The latter measure should always be adopted if the fluid contained within the pericardial sac is purulent. Here the pericardium should be broadly incised and free drainage established. This procedure must be carried out by a surgeon and the details need not be discussed in this book.

Puncture of the pericardium, however, is a task that every internist should be able to perform. The skin is carefully shaved and rendered aseptic by scrubbing with soap and water, one to two thousand bichloride solution, alcohol and ether. The trocar should be inserted either in the fifth or the fourth intercostal space on the left side about an inch from the left sternal margin. This point is selected in order to avoid wounding the mammillary vessels. It is usually best to use a local anesthetic, for instance an ether or chloride of ethyl spray, and to make a small incision at the point where the trocar is to be inserted. The nature of the operation should always be explained to the patient in order that he may remain quiet, exercise self-control and co-operate with the physician. The patient will usually have to be operated upon in a semi-recumbent position; if it is at all possible, however, he should be laid flat on his back. In order to avoid injuring the heart the needle should be introduced at first directly backwards and then backwards and downwards very slowly and carefully and not, as in paracentesis abdominis, quickly. The fluid should be withdrawn gradually and a hypodermic injection of ether or camphorated oil be given while the fluid is being removed. The operation is not without danger and should only be resorted to as an emergency measure when all other means have failed; for cases are on record in which the heart was injured and death occurred during the operation. Puncture of the pericardium from the xiphoid angle on the left side by inserting the trocar upwards and backwards is still more dangerous and can only be carried out with relative safety in enormous pericardial exudates.

II. THE ARTERIES.

ARTERIO-SCLEROSIS AND CHRONIC AORTITIS.

Causal treatment

Arterio-sclerosis in the majority of cases is the result of premature or normal senility. Causal treatment, therefore, in this category is self-evidently impossible. A small minority of the cases of arterio-sclerosis and chronic aortitis are due tc metabolic disorders, viz., gout, diabetes and obesity, or to certian chronic intoxications and chronic intestinal derangement, to the abuse of alcohol, tobacco and lead, and, above all, to syphilis. The causal treatment of all these forms of arterial degeneration is synonymous with the treatment of the underlying conditions, and will be discussed in their appropriate parts.

Symptomatic treatment

Diet

Symptomatic treatment must be directed chiefly towards preventing the over-tension of the peripheral vessels, in other words, towards keeping down the blood pressure. For the diseased arterial walls, owing to their lack of elasticity, determine high pressure and the high pressure in its turn presumably produces further degeneration of the arterial muscularis. It is hard to say in many of the cases which was the primary event, the high tension of the blood or the arterial degeneration, i. e., the sclerosis. The dietetic rules to be observed are the following: Alcoholic beverages and tobacco, as well as tea and coffee, should either be forbidden altogether or should be allowed only very moderately. Meat should be reduced to a minimum, and particularly those varieties of meat and meat preparations excluded from the diet that are known to contain extractives, for the latter raise the blood pressure (see page 20). A diet consisting largely of milk and plenty of fresh fruits and vegetables, cereals and a moderate amount of fats is the best. In so chronic a disorder as arterio-sclerosis care must, above all things, however, be taken to maintain general nutrition.

Reduction of calcium salts

Lactic acid therapy

As one of the characteristics of arterio-sclerosis is calcification of the arteries, it has been suggested that the ingestion of calcium should be reduced by excluding from the diet articles of food containing this element; chief among them eggs, cheese, rice, asparagus, carrots and milk. It will be seen that, on the basis of this theoretical postulate, a milk diet would be dangerous and a meat diet permissible. Practical experience teaches, however, that patients with arterio-sclerosis thrive very much better on a diet consisting largely of milk and the other articles enumerated above than on a meat diet, hence the decalcification plan, however seductive it may appear on theoretical grounds, is not practical. The suggestion has been made to counteract the deposit of calcium salts by the administration of lactic acid by mouth, and it can do no harm to adopt this plan, especially as lactic acid acts as an intestinal antiseptic and may be useful from this point of view. Lactic acid may be administered in the form of sodium or strontium lactate, in the dose of fifteen to twenty grains (0.1 to 1.2 gm.) three times a day, or as lactic acid in solution in syrup (1:20) a teaspoonful three or four times a day.

Restriction of liquids

Bathing

Climate and altitude

The ingestion of liquids should be somewhat restricted, for similar principles obtain here as in the treatment of compensated heart lesions (see page 21). The same applies to bathing and other hydrotherapeutic means, and the choice of a resort, climate and altitude. For the considerations that should govern us in advising our patients in regard to these elements of the treatment I therefore refer to *Compensated Heart Lesion* (page 24f).

Iodides of potash and soda

Dose and administration

Alkalies

The medicamentous treatment of arterio-sclerosis consists, first, in the use of the iodides, either of potash or sodium. Iodides have long enjoyed a great popularity in the treatment of this disorder, and there is no doubt that empirically they act beneficially in arterio-sclerosis. It seems very doubtful whether iodides can, in any way, cause regeneration of the sclerotic arterial walls, as some writers claim. They certainly, however, keep the blood pressure low and this, as I have explained above, may aid Nature in partially restoring normal conditions. Iodides, according to the investigations of Romberg, presumably produce this effect by reducing the viscosity of the blood, in other words, rendering it more fluid without diluting it. This is a very useful influence, for in arterio-sclerosis, owing to the rigidity of the arteries and the narrowing of their lumen, the propulsion of the blood is always impeded; if now the blood viscosity can be reduced it will flow more readily through the arteries and this factor, by relieving the heart of much labor, reduces the blood pressure. The iodides, moreover, exercise a very striking effect upon the subjective symptoms of the patient, especially the neurasthenic manifestations, the angina, the dyspnea, and the cardiac asthma. In order to be effective they should be given for long periods of time, preferably for years. In the beginning small doses, i. e., two to ten grains (0.12 to 0.6 gm.) should be given three times a day and the dose later increased a little. In order to enforce the effect of the iodides, they should be administered in combination with some alkali, preferably the bicarbonate of soda, or dissolved in some alkaline water. A very useful method of administering them is to give two to ten drops of the saturated solution of iodide of sodium in a glass of milk, to which is added one-third of a teaspoonful of bicarbonate of sodium. Iodides are best given after a meal; they should never be administered together with acid foods, nor to patients suffering from gastric catarrh, and should never be administered in a metal spoon. In order to prevent the development of iodism the administration of the iodides should be interrupted from time to time, and a very good plan is to give them for three weeks consecutive, then to stop their use for one week and later possibly to omit them for two or three weeks at a time.

Nitrites

For the purpose of reducing the blood pressure, the nitrites may also be used; they are best administered in the form of nitrates combined with sodium bicarbonate, as the nitrates undergo reduction to nitrites in the body. Lauder Brunton, who first advocated this treatment, recommended the following formula:

℞

Potassium bicarbonate.	1.8
Potassium nitrate.	1.2
Sodium nitrite.	0.03

To be given in half a litre of water, early in the morning, on an empty stomach.

Nitroglycerin and amyl nitrite

Or nitrite of soda may be given in tablets or solution in the dose of one to two grains (0.05 to 0.1 gm.).

Nitroglycerin and amyl nitrite are of very subordinate importance in the treatment of arterio-sclerosis. They are chiefly useful to relieve paroxysms of angina pectoris, or to stop the retro-sternal pain that is so distressing a symptom in chronic aortitis. This pain is also materially relieved by the application of the ice bag, poultices and counter irritants to the precordial region.

Heart tonics

Heart tonics should be given with care in arterio-sclerosis, on account of the inability of the arteries to adapt themselves rapidly to blood pressure changes. In later stages of the disease, however, when the heart has become insufficient and the blood pressure is low, digitalis, administered continuously in small doses, has its place. Groedel, than whom there is probably no greater authority on this subject, speaks very warmly of this practice and claims never to have seen any deleterious effect from it.

Truneczek's serum

Anti-sclerosin

Of late years Truneczek has described a serum to be used in arterio-sclerosis, and Goldschmidt a preparation called anti-sclerosin. Some good results are reported from the use of these remedies, but it is too early to pass judgment on their efficacy.

ANEURISM OF THE AORTA.

Aneurism of the aorta occasionally undergoes spontaneous cure by the deposit of coagulates of fibrin within the aneurismal sac. All causal treatment that we can employ for the cure of aneurism must, therefore, be directed towards aiding Nature in oducing such coagulates. In order to fulfill this purpose an deavor must be made to cause retardation of the blood stream d a reduction of the blood pressure, and if possible, a decrease the blood volume, for all these factors favor coagulation.

Rest Absolute rest in bed for many months at a time is the orthodox treatment of this disease. When this plan is adopted, the contractions of the heart are reduced by many thousands in the twenty-four hours. Thus Baümler, for instance, showed in a case of aneurism that the pulse fell from 95 to 56 after forty minutes of absolute rest. This means the elimination of 43,200 contractions of the heart in twenty-four hours.

Diet The amount of food and drink should always be reduced in order to decrease both the blood volume and the blood pressure. It is never, however, a good plan to chronically underfeed these cases, for a starving organism cannot develop full regenerative powers. As the patients are resting and quiescent the daily food requirement is *eo ipso* less; but in order to be perfectly safe it is always best to submit these cases, after they have been in bed for a number of days and their metabolism has adjusted itself to the new conditions, to a careful metabolic study, in order to determine what the minimum amount of food is that the patients require to maintain nutritive equilibrium. The technique of such an examination will be found described in the Chapter on *Diseases of Metabolism.*

The selection of the diet should be governed by the same principles that obtain in myocarditis and arterio-sclerosis. Large meals that can overload the stomach, or articles of diet that undergo fermentation and hence can distend the stomach, thus pressing the diaphragm upwards and interfering with respiration and the work of the right heart, should always be avoided. If full feeding is permitted, therefore, the patient should receive small meals at frequent intervals.

Tufnell diet One of the most popular dietetic schemes employed in the treatment of aortic aneurism is the régime arranged by Tufnell. His diet is altogether inadequate to properly nourish the patients; and while he obtained remarkable success in some cases, it is, nevertheless, a precarious matter to adopt so low a diet scheme as a routine. Tufnell advised restricting the total amount of solid food to 300 grammes in the twenty-four hours and the liquids to 240 cubic centimeters. This ration he allowed to be slightly increased if the patient became excited and very much dissatisfied with the restricted régime. The meals were arranged as follows:

For breakfast: 50 cc. of milk or cocoa with 60 grammes of bread and butter.

For dinner: 90 grammes of meat and 90 grammes of bread or potatoes and 120 cc. of water or very thin claret.

For supper: 60 cc. of weak tea and 60 grammes of bread and butter.

More liberal feeding

It is unnecessary to carry the restrictions so far, as equally good results are obtained with more liberal feeding, especially if a metabolic study precedes the arrangement of the dietary. Tufnell's scheme is, therefore, mentioned chiefly on account of its historical interest and because he deserves the credit of having first established the principle of restricted feeding in the treatment of aortic aneurism.

Restriction of liquids

It should rarely be necessary to reduce the liquids to less than 1,000 cc. in twenty-four hours. When the liquids are greatly reduced the patients naturally suffer from thirst; this distressing symptom can frequently be relieved without undue increase of the liquid intake by swallowing small pieces of cracked ice *ad libitum*, or by chewing gum.

Free evacuation of the bowels

Care should always be taken to promote free evacuation of the bowels, because straining at stool is always a precarious matter in aneurism of the aorta, and the abdominal plethora is to be avoided besides. The lower extremities of the patient should be kept warm and the legs and abdomen frequently massaged; these measures act beneficially, because both the heat and the massage reduce the peripheral blood pressure and draw much blood away temporarily from the region of the aneurism.

Massage of the lower extremities

Medicamentous treatment

Iodides

The medicinal treatment of aneurism of the aorta is of very subordinate importance. The iodides of potassium and sodium are used extensively. It is very doubtful, however, whether they exercise any influence whatsoever upon the progress or regress of the aneurism itself. Symptomatically, they often stop the pain in the precordium and the left upper extremity. They should be given in increasing doses, preferably beginning with five drops of the saturated solution three times a day and gradually increasing the dose until thirty or forty grains are being taken daily or the desired effect is produced. The same principle and technique should govern the administration of iodides in aneurism of the aorta as in arterio-sclerosis. (See page 55.)

Gelatine

The subcutaneous injection of gelatine has recently been recommended in the treatment of aneurism, and the claim has been made that gelatine administered in this way increases the coagulability of the blood, and hence favors the deposit of fibrin within the aneurismal sac. As gelatine is made from the hoofs of animals, there is always some danger of its containing spores of tetanus, and hence the gelatine solution should be very carefully sterilized before it is administered, as very disagreeable accidents have happened when this precaution was omitted. One of the best solutions to use for sub-cutaneous injection is the following:

℞

Gelatine,	1.5 gm.
Sodium chloride,	0.1 gm.
Distilled water,	100.0 cc.

M. Sig.: To be sterilized by discontinued sterilization and injected warm in doses of 20 to 30 cc. on four or five successive days.

The injections are best made in the gluteal region. They are frequently followed within a day or two by severe pain in the region of the puncture and occasionally by a rise of temperature. The pain may be relieved by local heat; the fever rarely lasts more than forty-eight hours and can be safely neglected.

The results obtained from this practice have been sufficiently favorable in some cases, especially when combined with certain other local measures to be discussed below, to warrant its employment, tentatively, at least, in *sacculated* aneurism. In the fusiform variety, or in dissecting aneurism, no good results have ever been published. One of the chief indices of the efficacy of gelatine injections is considered to be the disappearance of the radiating pains in the left upper extremity, signifying that the nerves of the brachial plexus have been relieved of some pressure on the part of the aneurism. A series of X-ray photographs may indicate *ad oculos* whether or not the size of the aneurism has been reduced.

Surgical treatment

In addition to these hygienic, dietetic and medicinal measures, certain surgical means may be employed to advantage in the treatment of aneurism, viz., in the order of their importance, galvano-puncture, acupuncture, filipuncture, proximal compression (applicable only to aneurism of the abdominal aorta) and ligation of the carotid and subclavian.

Galvano-puncture

Galvano-Puncture is performed as follows: A fine insulated needle is introduced into the aneurismal sac and connected with the anode of a galvanic battery. The cathode is attached to a sponge electrode that may be applied to the chest or the abdomen. Some authorities recommend inserting two needles into the aneurismal sac, the one connected with the anode, the other with the cathode. The former plan, however, is simpler and safer and produces the same results as the latter. The current should not be stronger than from ten to twenty milliamperes, and it should not be applied for longer than from fifteen to twenty minutes. It is well to test the coagulating power of the current before the needles are introduced into the aneurism, and this can be done as follows: The white of an egg is poured into a dish and the needles inserted into it. When the current is turned on a firm clot should form at the positive needle while a frothy clot forms at the negative pole.

Before the needles are introduced into the aneurism the patient should be told what it is intended to do, so that he may intelligently co-operate with the physician and exercise all his will power in remaining absolutely still. When the treatment is over, the needles are rapidly withdrawn and the little wound closed with collodion or court plaster. As a rule it is necessary to repeat this treatment two or three times at intervals of a week or so. There is always some danger of hemorrhage, and the possibility of embolism can never be excluded. A cure from this treatment is exceedingly rare, but quite a number of cases of aneurismal swellings have been reduced in size and the pain ameliorated.

Filipuncture

Filipuncture consists in introducing fine needles into the aneurismal sac, as above, and scarifying the intima of the opposite wall. The roughening of the intima is intended to favor the deposit of fibrin and coagulates. A few cases of symptomatic improvement but no cures are reported from this treatment.

Acupuncture

Acupuncture consists in the introduction of iron or silver wire, horse-hair, silk thread or cat-gut into the aneurism, the object being to cause the precipitation of fibrin around these threads. As a rule, the pieces are only a few millimeters long; threads and wires several centimeters long have been introduced, however, without untoward results, but, unfortunately, also without particularly favorable effects. As this operation is very simple and seems to be practically devoid of danger, and as it occasionally does some good, it may be employed, but only in desperate cases, in which all other means have failed.

Compression

In aneurism of the abdominal aorta situated low down, *compression* of the aorta between the heart and the aneurism has been attempted; the object being to cause retardation and stasis of the blood stream in the aneurismal sac and thereby creating conditions that favor coagulation and hence obliteration of the aneurismal cavity. This procedure must, of course, be carried out under an anesthetic. The duration of the operation must vary according to the reaction of the patient, but in order to exercise any effect compression should be continued for several hours. The amount of pressure should be so great as to cause disappearance of pulsation in the sac. The operation may be repeated. The results reported are not particularly favorable and untoward consequences have occasionally been observed, for instance, peritonitis and mechanical lesions of the duodenum, the pancreas and the celiac plexus from the pressure.

Ligation of carotid and subclavian arteries

Ligation of the common carotid and the sub-clavian artery has been used as a desperate resort, but no good results are reported from this operation. It is mentioned merely for completeness' sake and on account of its historical interest.

That these various surgical measures must be combined with rest and a restricted diet, possibly the use of iodides and gelatine, (see above), need hardly be emphasized.

Symptomati treatment

The symptomatic treatment of aortic aneurism concerns itself chiefly with the relief of pressure symptoms. Chief among these are pain radiating in various directions according to the location of the aneurism and the nerve branches compressed; venous congestion in various organs of the body, chiefly the head and arms in aneurisms of the upper aorta; dyspnea from compression of the trachea or from congestive bronchitis or from bilateral abductor paralysis (pressure on the recurrent laryngeal nerve at the aortic arch).

Relief of pai

For the relief of the pain the ordinary anti-neuralgic remedies may be employed. For the pain produced by the aneurism itself the ice bag or a Leiter coil to the precordium may be used, as described in the part on *Pericarditis* (page 51). Occasionally a narcotic or anodyne ointment applied to the chest relieves the pain. A very useful prescription for such an ointment, recommended by Ortner, is the following:

℞

Menthol,	2.0 gm.
Cocaine muriate,	0.2 gm.
Morphine, muriate,	0.4 gm.
Olive oil,	1.0 cc.
Lanolin,	2.0 gm.

M. Sig: Apply locally.

Dyspnea

For the dyspnea due to pressure hyperemia of the trachea or bronchial mucosa, the ordinary remedies for bronchitis should be employed (see Section *Bronchitis*). The same precaution in the selection of expectorants should be observed, however, as in the treatment of the bronchitis due to venous stasis in decompensated heart lesions (see page 38), and particular care should be exercised to avoid the administration of emetic expectorants, chiefly ipecac, because the strain of vomiting is always dangerous in aneurism.

Bleeding

Bleeding is a very useful measure in aneurism because it rapidly relieves the congestion and generally stops the pain.

This applies particularly to the disagreeable congestion occurring about the face, head, neck and upper extremity; here bleeding is without doubt the sovereign remedy for producing symptomatic relief.

Pressure symptoms

Disagreeable symptoms resulting from the pressure of the aneurism on the vagus or the phrenic nerve must often be relieved symptomatically by the use of opium or bromides and occasionally, in emergencies, by whiffs of chloroform. Sometimes it may become necessary to perform tracheotomy in order to relieve laryngeal dyspnea due to bilateral abductor paralysis, resulting from pressure of the aneurism upon the laryngeal nerves.

III. NEUROSES OF THE HEART.

ANGINA PECTORIS.

Angina pectoris is, in most cases, due to ischemia of the heart muscle. The factors that determine an inadequate supply of blood to the heart are manifold, and may be either organic or functional in character. In most instances angina pectoris is a symptom of a general arterio-sclerosis involving the coronary arteries and, possibly, also the endocardium; in other cases it appears that the coronary arteries alone are sclerotic, and, in still other cases, there is an aortitis, due to different causes, producing mechanical narrowing of the orifices of the coronary arteries in the aortic wall; or there may be thrombosis or embolism of these vessels. Besides, spasmodic contraction of the walls of the coronary arteries, due to a variety of possible neurotic causes, may occur. Finally, there is also a symptomatic form, so-called pseudo-angina, that occasionally develops on the basis of a neurasthenic or hysterical condition.

Causal treatment

The causal treatment of angina pectoris must, therefore, take all these different possibilities into consideration. Thus all the factors that can become operative to produce arterio-sclerosis or arteritis (see page 53) should be treated provided any early evidence of arterial degeneration is determinable. Every case of angina pectoris should be given the benefit of an antiluetic treatment. If the patient is manifestly neurotic then appropriate hydro-therapeutic, medicinal and rest treatment, as described in the Section on *Gastric Neuroses*, should be instituted.

Prophylaxis

As a means of prophylaxis the diet should be arranged in such a way that all principles capable of exciting the heart and raising the blood pressure are eliminated. Meat extracts and bouillons, raw, rare, cured and smoked meats, internal organs, tea and coffee should all be forbidden because they contain extractives (purin bodies) that notoriously irritate the heart. Alco-

Diet

hol should be used with the greatest care, and smoking, even prolonged sojourn in a smoke-laden atmosphere, should be interdicted. Very hot and very cold beverages, spices, carbonated waters, should all be forbidden and all distension and overloading of the stomach carefully avoided, as otherwise reflex and mechanical irritation of the heart from the stomach may result. Other exciting causes to be avoided are sudden physical exercise, and especially quick movements of the left arm and left upper extremity.

Unfortunately, the majority of cases of true angina pectoris are not recognized until the degeneration of the aorta and the coronary arteries has become irremediable. In such cases one is limited to regulating the patient's mode of life in such a way that all causes that can notoriously precipitate an attack are eliminated. If one could begin early, even with the prophylactic treatment, much would be gained, but unfortunately early manifestations of angina pectoris are usually misinterpreted, owing to the mild and transitory character of the attacks, and, above all, to the peculiar tendency of anginal pains to radiate into remote parts of the body, thus simulating neuralgias of various parts, lumbago, renal and hepatic colic or gastralgia.

Vaso-dilators in high pressure angina

For all these reasons the treatment of angina pectoris is in most cases symptomatic and limited to aborting or relieving the paroxysms. The pain is excruciating and the sense of impending death horrible. The ordinary analgesic remedies are altogether too slow in their action to have a place in the treatment of acute attacks of angina pectoris. As hypertension is present in most cases of angina pectoris the use of vaso-dilators is generally indicated. Here the character of the pulse and, above all, of the second aortic sound, should be carefully but quickly studied. If the pulse possesses the characteristics of a high tension pulse, and if the second aortic sound is markedly accentuated, then the use of vaso-dilators and anti-spasmodics is always indicated.

Cardiac tonics in low pressure type of angina

This study of the heart and blood pressure need, generally, only be performed during the first attack, chiefly to determine whether one may not possibly be dealing with a case of angina pectoris due to advanced myocarditis, or to aortitis without general arterio-sclerosis; for, in such cases the anginal attack may be due to, or may be complicated by, acute dilatation of the heart, with low arterial tension, as indicated by a weak second aortic sound, possibly murmurs (due to relative, i. e., muscular insufficiency), a correspondingly low radial pulse and a weak apex beat. In this latter class of cases treatment directed against high tension is wrong; digitalis and other cardiac tonics and pressure-raising remedies are indicated, and not vaso-dilators; the latter, in fact, do much harm, fail to relieve the symptoms, and may even determine death.

Nitrites

Excepting in this comparatively rare class of cases, however, the nitrites are the remedy of choice. Amyl nitrite is deservedly the most popular remedy in angina pectoris. The drug is best dispensed in glass pearls containing three to five drops of amyl nitrite; patients suffering from angina pectoris should carry these pearls with them. Upon the appearance of the attack or of premonitory symptoms, such as pain radiating into the left arm, one of these pearls should be broken in a handkerchief and the vapors inhaled. The vaso-dilator effect becomes apparent almost instantaneously, the face becomes flushed and the head feels full. If the attack is not stopped by the first inhalation, two, three or four pearls full of amyl nitrite should be inhaled at short intervals.

Amyl nitrite

Morphine

If this treatment fails to stop the agonizing pain, then recourse must be had to morphine, a drug that acts favorably in this condition, both by its vaso-dilator effect and its tendency to reduce the blood pressure. It should be given hypodermically, in doses of at least one-fourth to one-half grain (0.016 to 0.03 gm.) repeatedly. Theoretically, repeated doses of morphine are contra-indicated in cases of general arterio-sclerosis suffering from angina pectoris, in which there is arterio-sclerotic degeneration of the kidneys, because, under these circumstances, the drug is eliminated so slowly that a dangerous cumulative effect may be produced; but this will be a rare event. Inasmuch as morphine exercises its influence very much more slowly than amyl nitrite, it is best to administer a hypodermic of morphine as soon as the attack begins and while the amyl nitrite is being inhaled, for in this way valuable time may be saved.

Chloroform

In case neither amyl nitrite nor morphine relieve the pain, then chloroform should be given, preferably by inhalation. This is, of course, a somewhat precarious procedure in any form of heart disease and hence this plan should only be adopted as an extreme emergency measure.

Applications to the precordium

Locally, hot applications, poultices or a mustard plaster to the precordial region may be of some benefit; counter-irritation of this kind should always be attempted, but only in addition to the other measures enumerated.

Interim treatment

In the interim between attacks, and in a sense as a prophylactic measure, nitroglycerin and nitrites may be given; to be efficacious, however, they should be given continuously. Nitroglycerin may be administered either in the form of one one-

Nitroglycerin

hundredth to one one-hundred-and-fiftieth grain tablets, two or three times a day, or preferably in the form of a one per cent. alcoholic solution, beginning with one drop of this three times a day and increasing the dose a drop every four or five days until flushing and headache appear. The dose should then be reduced a drop or two and the patient kept continuously on this amount. From time to time the dose should again be increased until flushing and headache appear; and it will be found that after a time more can be tolerated than at the beginning.

Erythrol tetranitrate

A preparation of nitroglycerin that has recently attained well deserved popularity is erythrol-tetranitrate. This remedy grants a more prolonged vaso-dilator effect than nitroglycerin. The fall in the blood pressure begins about half an hour after its administration and usually persists for three or four hours. It may either be given in tablet form in doses of one-twelfth grain (5 mg.) every four hours, or in the form of drop doses of a concentrated solution by mouth. Here, again, the appearance of flushing and headache indicate whether or not too much is being given.

Nitrites

The nitrites, finally, should be administered in doses of three grains (0.15 gm.) of sodium nitrite or potassium nitrite, three times a day, in milk or water; or the formula of Lauder Brunton, given in the Section on *Arterio-sclerosis* (see page 56) may be used to advantage. The use of iodide of potash has already been mentioned above.

Iodide of potash

Pseudo-anginal paroxysms

Seizures of pseudo-angina pectoris, due to functional nervous disorders, and without evidence of arterio-sclerosis or myocarditis, can often be successfully treated by cold and pressure over the precordium, and a strong mental suggestion as de-
over the precordium, and a strong mental suggestion. During the paroxysm the administration of a teaspoonful of ether often relieves at once. In the interim the underlying neurosal element must be attacked, and all those general prophylactic measures instituted that are employed in true angina pectoris.

PALPITATION.

Introductory

The disagreeable subjective character of palpitation makes it one of the most important symptoms to treat; for patients are apt to worry more about it than about severe organic heart lesions that do not give rise to symptoms that are so noticeable. Palpitation may occur in organic heart disease, but more commonly it is present when the heart is organically intact. In few conditions does successful treatment depend so much on a careful diagnosis. Organic disease of the heart, especially fatty degeneration, dilatation and disease about the aortic valves should always be carefully looked for. Congenital smallness of the heart and narrowing of the arteries are also important findings. Palpitation in organic heart disease is always a sign of cardiac weakness and occurs chiefly when more work is suddenly thrown upon the heart than its reserve force can meet.

Functional palpitation

Organic nervous disease

Exophthalmic goitre

In the majority of cases there is merely over-irritability of the heart and its ganglia without heart lesions, possibly overaction of the accelerator nerves of the heart (the sympathetic), or defective action of the inhibitory nerves (the vagus). These perversions of the action of the heart muscle and of the nervous apparatus of the heart may be purely functional, or they may be due to organic nervous disease. Hence particular care should be exercised to search for disease of the sympathetic or its ganglia, and for disease of the central nervous system. To the same category also belong early cases of exophthalmic goitre; so that in every case of palpitation, the eyes and the thyroid should be carefully examined for evidence of Graves' disease. Inasmuch as exophthalmic goitre occasionally appears without exophthalmos, and without goitre, the minor symptoms of this affection (the tremor, sweating, lid-signs, etc.) should be carefully looked for.

Anemia and malnutrition

Chlorosis

Palpitation may also be a part phenomenon of anemia or chronic malnutrition in which there is irritable weakness of the nervous apparatus governing the heart's action. Very important in this respect is chlorosis, for here, as shown in another chapter, we have aside from the anemia, an unstable nervous system and very commonly congenital smallness of the heart and of the arterial capacity.

Early tuberculosis

Nephritis

In every case of palpitation the apices of the lungs should always be carefully examined for evidences of early tuberculosis, for it is well known that in apical tuberculosis palpitation of the heart is very common. Whether this is due to a special toxemia or to irritation of the sympathetic fibres in the neck is undetermined. In nephritis, too, especially in the cardiovascular type of renal disease (Bright's disease), palpitation is a common sign, hence the urine should always be carefully investigated for the presence of renal elements, or albumen, and for renal inadequacy.

Intoxications

Certain intoxications, notably by tea, tobacco, coffee, alcohol and even heart tonics (digitalis, strophanthus, strychnia, when employed injudiciously), can all cause palpitation.

Neurasthenia and hysteria

Finally, there is a purely neurotic form that develops on the basis of neurasthenia or hysteria. Here exciting causes must be very carefully looked for. These may be external and consist of some sudden emotional shock, a fright, a loud noise, or a flash of light, etc., or they may be internal and reflex in character; thus indigestion, especially when associated with gaseous fermentation or flatulency, intestinal parasites, abdominal adhesions, gastro- and enteroptosis, disorders about the genital apparatus, especially the ovaries and uterus, hemorrhoids and abdominal plethora in general, may all reflexly, in predisposed subjects, irritate the heart in such a way that palpitation is produced.

Reflex causes

Prophylaxis

To prevent the attacks of palpitation the underlying cause must be treated. In pálpitation resulting from over-exertion or fatigue, especially in individuals whose heart is congenitally small or whose arteries are narrow, or in subjects with a thorax paralyticus or a phthisical habit, the amount of exercise must be carefully regulated. Such individuals must learn how much physical exercise they can stand without developing palpitation and should carefully train the heart to increased labor by means of Schott and Oertel exercises or hydriatic means (see page 23). Very hot baths, and, above all, Turkish baths, should be forbidden such subjects and the use of coffee, tea, alcohol and tobacco should be restricted or stopped. In phthisical patients particularly the administration of heart tonics and analeptics should be carried out very conservatively and preferably reserved only for emergencies.

Exercise

Bathing

Treatment of palpitation in organic heart disease

In palpitation occurring in organic disease of the heart in subjects who are not neurotic, the treatment is synonymous with the treatment of the underlying cardiac disorder. One should constantly remember that palpitation is often an early sign of valvular disease so that the diagnosis of nervous palpitation should always be made very guardedly. Heart tonics judiciously administered according to the principles described under compensated valvular disease, especially when combined with drop doses of the tincture of aconite, will relieve the palpitation in these cases.

Neurotic type
Rest cure

If the palpitation is purely neurotic in type without organic disease of the heart a rest cure and appropriate hydro-therapeutic measures, as lukewarm baths, are particularly valuable in reducing the frequency of the attacks. Suggestive therapy also helps. The patients should be carefully instructed in regard to the purely functional character of their heart symptoms and should be encouraged not to worry. All emotional or mental strain should be strenuously avoided. The patients should be instructed to reduce the use of tea, coffee, alcohol and to stop smoking. Particular care should be taken to find possible reflex causes for the palpitation, and, for this reason, the genital apparatus, the rectum and the nose should be carefully examined and any abnormalities corrected; intestinal parasites should be looked for and removed; the function of the stomach and intestine should be regulated. The exact arrangement of the diet must depend on the functional state of the digestion and, for this reason, careful analyses of the stomach contents should be made from time to time and treatment instituted accordingly. No general rules can be formulated except that the meals should be small in order to prevent over-loading and distension of the stomach and should contain little carbohydrate in order to forestall fermentative dyspepsia, flatulency and meteorism. The food should never be too hot nor too cold, nor should it contain strong spices.

Diet in neurotic cases

Drugs in neurotic cases

In purely neurotic cases valerian and bromides are the most useful remedies for continuous use. Sodium bromide in ten to fifteen grain doses, two or three times a day, combined with the ammoniated tincture of valerian, one to three drachms (4 to 12 cc.), and the tincture of nux vomica five to ten drops, is a useful combination; or the pill of the three valerianates (Goodell) may be used to advantage, viz:

Valerian
Bromides
Nux vomica

℞

Quinine valerianate,
Iron valerianate,
Ammonium valerianate, āā 1 gr. (0.06 gm.)
M. Sig. One such pill two or three times a day.

Symptomatic treatment of the paroxysm

Deep breathing

Counter-irritation of the nasal mucosa

Faradization of the vagus

The treatment of the paroxysm does not differ materially from the preventive treatment, excepting that somewhat more energetic measures are employed. Any reflex stimulation of the vagus usually stops the paroxysm. This reflex stimulation may be produced by instructing the patient to breathe deeply; or by the use of smelling salts or iodo-glycerin applied to the nose on a probe; or by an indifferent alkaline nasal spray. In very severe cases faradization of the vagus and neck, as described in the Section on *Exophthalmic Goitre* (page 106) is often useful.

Counter-irritants to precordium

Clothing that is tight about the chest and waist should be removed. A belladonna or mustard plaster may be applied to the precordial region. Better still is the application of cold in the form of an ice bag, for both the cold and the pressure upon the heart and, in hysterical cases, the suggestive effect, aid in quieting the heart; at the same time hot water bags may be applied to the feet and the legs vigorously rubbed. Some patients of the neurotic type derive almost instantaneous relief from compression of the heart by means of a pelotte arranged like a truss, to be adjusted around the thorax as soon as palpitation occurs. Here, too, a suggestive element presumably plays an important part.

Cardiac stimulants

The medicamentous treatment in cases due to organic disease of the heart consists in the use of strong cardiac stimulants (hot coffee, brandy, digitalis, camphor, ether, ammonia, see page 32. The special treatment of palpitation in compensated aortic insufficiency has already been discussed on page 19. If the blood pressure is very high, amyl nitrite may be inhaled.

Aconite

Chloroform
Morphine
Sodium bromide
Chloral

If there is no organic disease of the heart and no dilatation from over-exertion, then the tincture of aconite in drop doses every hour is the most efficacious remedy. Often in such cases a few whiffs of chloroform, or one-fourth grain of morphine, hypodermically, also stop the paroxysm promptly. Sodium bromide and chloral, ten grains of each, repeated every hour and a half or two hours for two or three doses, will prevent the recurrence of the attack. This combination, too, is valuable as a prophylactic measure in nocturnal palpitation. Here, if given just before retiring, the restlessness and sleeplessness are allayed and the nocturnal attack of palpitation prevented.

Valerian
Asafetida

In purely hysterical cases the ammoniated tincture of valerian, one to three drachms (4 to 12 cc.) or asafetida, preferably given as the Aloes and Asafetida Pill in four to eight grain doses, occasionally stop the paroxysm. That a strong mental suggestion should be attempted in all cases of hysterical or neurasthenic palpitation need hardly be repeated. Very often a command on the part of the physician to exercise self-control will stop the palpitation. In other cases the repeated assurance that there is no danger, or soothing suggestions and, in extreme cases, hypnosis, may be more effective than a command.

Catharsis

Lavage of the stomach

If the bowels are constipated when the attacks come on, or if there is evidence of much abnominal plethora (hemorrhoids), meteorism or flatulency, a brisk saline cathartic, i. e., a tablespoonful of sodium or magnesium sulphate and a colonic flushing should be given. If there is evidence of acute distension or dilatation of the stomach, then evacuation of the stomach contents through a stomach tube followed by lavage (see index) often suffices without further medication to stop the paroxysm of palpitation.

ARRHYTHMIA.

Irregular heart action, abnormal slowness or rapidity of the heart, may either accompany a variety of organic disorders of the heart and arteries, chiefly myocarditis and dilatation occurring in the course of infectious diseases or of arterio-sclerosis; or they may be a part symptom of some organic lesion of the nervous system or of a functional neurosis; or, finally, they may be the result of intoxication by alcohol, tobacco, coffee, lead, etc. The different varieties of irregular heart action, viz., intermittent, paradox, bigeminal and trigeminal pulse, embryocardia, bradycardia, tachycardia, gallop-rhythm and delirium cordis must all be carefully analyzed and the underlying causes determined. If due to valvular lesions or myocardial or arterio-sclerotic changes, these conditions should be treated as described under those disorders. If due to cerebro-spinal disease (syphilis, sclerosis, gumma, hemorrhage), then large doses of iodides should always be given a trial. If due to a functional neurosis, then this should be treated, at the same time reflex causes in different organs should be sought for and removed. The toxic varieties self-evidently call for the withdrawal of the toxic agent.

It will be seen, therefore, that the different forms of irregular heart action call for similar causal treatment as palpitation. The symptomatic treatment is altogether identical with that of palpitation; in fact, the combination of arrhythmia and palpitation, especially tachycardia and palpitation, is the rule. For the details of this treatment I, therefore, refer to the Section on *Palpitation*. Slow pulse (bradycardia), it may be remembered, finally, is often a physiological phenomenon, in no way endangers the life of the patient and calls for no special treatment

CHAPTER II.

DISEASES OF THE BLOOD.

I. THE ANEMIAS.

Nomenclature and definition

The nomenclature and classification of the anemias is involved and confusing. Every anemia is characterized by a reduction of the hemoglobin (oligochromemia). Pernicious anemia is characterized by the appearance of morphological elements in the blood (megalocytes and megaloblasts) that are not normally present; in other words, there is always a qualitative perversion of the blood-forming function, involving chiefly hemopoesis in the bone marrow (megaloblastic degeneration and reversion to an embryonic type). In simple anemia there is merely under- or over-activity of this function without qualitative perversion.

Until recently the pernicious variety was called primary (progressive) anemia, and the simple variety, secondary anemia. This nomenclature is incorrect, for pernicious anemia is by no means always a disease *sui generis,* nor "idiopathic," but often like simple anemia directly traceable to definite and determinable causes; and simple, so-called secondary anemia not infrequently develops into pernicious, so-called primary anemia.

For the sake of clearness, therefore, the anemias in this chapter will de discussed under the headings of *progressive pernicious anemia, simple anemia* and *chlorosis;* the latter disorder presenting the blood picture of a simple anemia, but differing from all other simple anemias, both in regard to its genesis, its blood pathology and its treatment, and hence calling for special and separate discussion.

PROGRESSIVE PERNICIOUS ANEMIA.

Causal treatment

The causal treatment of pernicious anemia must consider many factors. Many cases of progressive pernicious anemia have been found to be due to the presence of intestinal parasites, notably bothriocephalus latus, so that in all cases this intestinal parasite should be looked for, and removed, if it is found. Here the results are brilliant, for this variety of pernicious anemia is distinctly curable by removing the cause. Other parasites of the bowel can also be incriminated with producing pernicious anemia, and, for this reason, anthelmintics, administered as de-

Intestinal parasites

scribed under *Diseases of the Intestines,* should as a preliminary step always be given a full trial in every case of progressive pernicious anemia that comes under observation. There is also some evidence to show that other forms of bowel intoxication may occasionally produce pernicious anemia, and for this reason free evacuation of the bowel contents should be promoted in all cases by the administration of laxatives; the latter being to advantage combined with some of the intestinal antiseptics (see index). Still other forms of pernicious anemia develop as the result of atrophy of the gastric or intestinal glands, so that it is very important to make a careful analysis of the stomach contents to determine the state of the stomach function and to treat any perversion according to proper rules. Again, blood parasites, notably the plasmodium of malaria, filaria sanguinis and distoma hematobium should be looked for and their removal attempted. Here quinine and other drugs as described elsewhere are the best remedies. Syphilis, too, occasionally produces pernicious anemia and antiluetic treatment will lead to the goal more rapidly than any measures directed towards improving the condition of the blood symptomatically, although the prognosis, in syphilitic anemia of the pernicious type, is not favorable even under antisyphilitic medication. The same applies to the pernicious anemia occasionally seen in pregnant women. Statistics show that even the induction of premature labor and the removal of the fetus exercise no beneficial effect on the pernicious anemia of pregnancy after it has once become established.

Autotoxemia from the bowel

Gastric atrophy

Blood parasites

Syphilis

Pregnancy

General hygiene

Rest

Diet

Aside from all this causal treatment the general hygiene is very important. The patient should be put to bed and kept there for weeks until the blood picture improves, i. e., until a remission occurs. During the period of rest the diet should be arranged according to the condition of the stomach and bowel functions. A bland, non-irritating diet consisting chiefly of milk, cereals, eggs, fresh fruits and vegetables is usually well borne. The patients, as a rule, have a very strong aversion to meat, and meat-eating should not be forced, especially as the hydrochloric acid secretion in the stomach is usually greatly reduced in pernicious anemia. Hydro-therapeutic measures, on account of the weakened condition of the patient, the impoverished state of the blood and the deficient vaso-motor reaction, had better be omitted, at least during the active stage of the disease.

Hydrotherapy

Arsenic

The best remedy to administer in pernicious anemia is arsenic. This drug does not cure the disease, but it certainly aids in improving the condition of the blood, and hence in removing many of the most distressing symptoms that are attributable to the deficient nutrition of various organs, that results from the decrease of hemoglobin in the blood. Arsenic may be administered either in the form of Fowler's solution or as arsenious acid. It is best to begin with small doses, gradually increasing them, and to keep the patient for a time just below the maximum dose that has been reached; then gradually to reduce the dose again. Some authorities advise beginning at once with large doses, but I have never been able to convince myself that this treatment is more efficacious or more rapid in its results; in fact, I consider it occasionally dangerous, in view of the possible idiosyncrasy of the patient against arsenic and on account of definite contra-indications to its use that may not be discovered until the drug is being administered.

Dose and administration

Such contra-indications are the existence of dyspeptic symptoms and of diarrhea before the drug is given, or their development soon after its exhibition. In all these cases arsenic should be discontinued until the diarrhea is checked or the dyspeptic symptoms are relieved. Sometimes, in very urgent cases, these contra-indications to the use of arsenic may be neglected; care being taken that some measures are instituted that can counteract the bad effects that we must expect from the use of the drug; thus arsenic given by mouth with abundant quantities of fat is occasionally well borne; or the addition of opium to an arsenic preparation may sometimes effectually counteract the tendency to diarrhea. In treating patients in this way we are on the horns of a dilemma, and are simply choosing the least of two evils; for it is often most important to use arsenic, even though distressing symptoms are produced by its administration.

Contra-indications to the use of arsenic

If Fowler's solution is used one should begin with ten drops in water or milk, three times a day after eating, gradually increasing the quantity by a drop a dose a day, i. e., by three drops a day. As a rule, this increase can be borne for about ten days, i. e., until the patient is taking sixty drops during the twenty-four hours. Occasionally symptoms of arsenic poisoning appear before the maximum dose is reached. The patients then complain of burning in the mouth, thirst, dyspeptic symptoms with eructations and pain in the epigastrium, some puffiness about the eyelids and the appearance of red blotches in different parts of the body. When such symptoms appear, the dose of arsenic should at once be reduced and occasionally it may even become necessary to stop the drug altogether until these symptoms disappear.

Fowler's solution

Arsenious acid is best given in the form of the so-called Asiatic Pills, which contain some pepper. The latter stimulates the secretion of hydrochloric acid and aids in the rapid absorp-

Asiatic pill

tion of the arsenic, thereby, in a measure, preventing injury to the gastric mucosa by the drug. One should begin with one such pill a day, gradually increasing the dose until six, or eight, or ten pills are taken a day. This latter dose corresponds to about sixty to seventy drops of Fowler's solution.

Arseniated mineral waters

Still another method of giving arsenic, in case neither Fowler's solution nor arsenious acid can be borne, is to use arseniated mineral waters. A number of these waters are on the market (Lithico water, Roncegno, la Bourboule, Guberquelle and others). Most of these contain very small quantities of arsenic combined, as a rule, with iron. They should be administered at first in small quantities, preferably in tablespoon doses, gradually increasing the amount until a wine glass full, two or three times a day, is being taken. Their composition, however, is not constant and one is never sure of an arsenic effect when giving these waters.

Hypodermic administration of arsenic

Cacodylate of soda

The hypodermic administration of arsenic is not to be advised in pernicious anemia, for disagreeable local symptoms are very apt to appear. The only arsenic preparation that can be given with safety is the cacodylate of sodium, in the strength of 1 to 500, in 10 cc. doses, once or twice a day. I have had the impression, however, that this method of administering arsenic, useful though it may be in certain other conditions, notably chorea and leukemia, is of very subordinate value in pernicious anemia, and certainly inferior to the administration of arsenic by mouth.

Iron not indicated

Iron is not indicated in pernicious anemia. My opinion is that it does more harm than good, for it seems to exercise no effect upon the constitution of the blood, while it usually irritates the stomach and disturbs the digestion.

Bone marrow

Hemoglobin

Bone-marrow was, at one time, employed in the treatment of pernicious anemia, but its use is being abandoned. I have never seen any good results from its exhibition. The same applies to the administration of dried blood or hemoglobin in solution by mouth or per rectum.

Transfusion of healthy blood

In every advanced cases of pernicious anemia, in which the patient is in imminent danger of his life, transfusion of blood from a healthy subject, or of physiological salt solution, or the injection of the latter by hypodermoclysis, are exceedingly useful measures.

Technique of ransfusion

The transfusion of blood from a healthy individual to the patient should be performed as follows: A compression bandage is applied about the arm, both of the healthy individual and of the anemic subject and the anterior surface of the arm of each thoroughly cleansed with soap and water, 1 to 1000 bichloride solution, alcohol and ether; a hollow needle connected with a thin rubber tube is now inserted into a vein of the healthy subject and about 50 cc. of blood aspirated with a syringe. At the same time an assistant inserts a similar needle connected with a rubber tube into the vein of the patient, allowing a few drops of blood to ooze out of the tube, and then rapidly connects it with the syringe containing the blood from the healthy subject. This blood is now slowly injected into the veins of the patient, and the operation repeated four or five or six times in the course of five to twenty minutes. That everything should be rigidly sterile need hardly be mentioned. It is always safer to have a number of syringes ready, so that a new syringe can be used for each transfusion, otherwise there is always danger of coagulation occurring in the syringe or its nozzle, with the possibility of forcing a fibrin coagulate into the veins of the patient; such an accident would, of course, be fraught with very serious consequences. This method of transfusion is called the direct method.

Indirect method of transfusion

There is also an indirect method. It is more complicated, less safe and not so easy of execution. It consists in withdrawing about 400 cc. of blood from the normal subject by venesection, rapidly defibrinating this blood by beating it with a glass rod, filtering off the clot and injecting the plasma through an ordinary transfusion apparatus into the veins of the patient. In performing this operation the canula leading from the transfusion apparatus must be tied into a vein in the patient's arm. This requires dissecting out the vein, a manipulation that calls for considerable skill and most rigid asepsis, and that, besides, is more painful than the insertion of a canula or trocar needle directly into the vein.

Disagreeable sequelae following transfusion.

Many patients react to this transfusion by a chill, a rise of temperature and sweating, all symptoms that are presumably due to a ferment intoxication. Sometimes during the injection of blood the patient becomes cyanotic and dyspneic; these are indications to stop the infusion of blood.

Results

The results obtained from this practice are exceeding variable; some patients improve immensely at once, in others no effect whatsoever is observed, and in still others the disagreeable consequences enumerated above make their appearance. A few deaths have been known to follow transfusion. The method nevertheless should, at all events, always be given a trial, especially when the cases are in so desperate a position that any measure, however dangerous it may be, becomes justifiable.

Transfusion of normal salt solution

Next in importance to the transfusion of blood is the transfusion of normal salt solution, containing about 0.8 per cent of sodium chloride to a litre of water; or this salt solution can be

Hypodermoclysis

injected under the skin as follows: The sterile solution is poured into a fountain syringe that is elevated about two or three feet above the bed; the fountain syringe is connected with a rubber tube that branches out into two ends each connected with a hollow needle; the two needles are inserted either into the skin of the thigh or of the abdomen or into the pectoral fascia underneath the breasts. From one to two litres of the solution may be injected in the course of from ten to fifteen minutes, care being taken that the region into which the fluid is injected is massaged during all the time the solution is flowing; this greatly facilitates the absorption of the salt solution. This method is quite painful and occasionally requires chloroform narcosis. The results obtained from saline solution are not so favorable by far as those obtained from the transfusion of normal human blood.

Treatment during remissions

During the periods of remission the patients should continue the use of small doses of arsenic. They should live on a nourishing diet similar to the one described above, and should preferably seek a resort with a moderately temperate climate, with the maximum of sunshine and clear days, where they can lead an out-of-door existence, preferably at a moderate altitude, not exceeding three thousand feet.

Sooner or later in the disease the condition will become aggravated again, provided the anemia is not due to intestinal parasites. As soon as the condition of the blood becomes bad and the patients grow weak again, they should at once be put to bed and energetic treatment immediately instituted.

Symptomatic treatment

Symptomatic treatment is synonymous with the treatment of the organs whose function becomes deranged; thus the gastro-intestinal, the cerebral symptoms, the symptoms about the heart, the hemorrhages, should be treated as described in other sections.

SIMPLE ANEMIA.

Indications for treating simple anemia

Simple anemia is always a symptom of some underlying disorder, hence the treatment, broadly speaking, is synonymous with the treatment of the cause that produces the impoverishment of the blood. Every effort, therefore, should be bestowed upon finding this cause and removing it. Occasionally, however, simple anemia persists even when the underlying cause is removed, as, for instance, the anemia developing after internal or external hemorrhages, profuse vomiting, pregnancy, intoxication by intestinal parasites and various infectious diseases. In all of these cases the resulting anemia would, in all probability, heal spontaneously in time, but nevertheless it often becomes necessary to aid Nature in its reparative endeavors as otherwise serious nutritional disorders would develop in different organs.

Again, the disease which produces the anemia may be very chronic in character, so that while the cause of the anemia is known it may be difficult or impossible to remove it. This applies particularly to the simple anemia seen in tuberculosis, in chronic suppurative processes, after prolonged lactation, in malnutrition due to stenosis of the esophagus or organic diseases of the stomach, in nephritis, syphilis, chronic malaria and in various forms of chronic poisoning. Here the anemia attains almost the dignity of an independent affection and urgently calls for special treatment. It is well to realize that in anemia due to chronic disorders of an irremediable character it is usually impossible to completely restore altogether normal conditions in the blood. Very much, however, can be done in this direction and no effort should, therefore, be spared to attain the best possible conditions.

Diet

In the treatment of anemia the regulation of the diet is a very important element. It is clear that every effort should be advanced to maintain nutritive equilibrium, that is, to supply an amount of food sufficient to enable the organism to put forward its best efforts towards producing the regeneration of the blood. This can never be accomplished if the patient is chronically underfed. Unfortunately, in simple anemia the gastro-intestinal function is frequently perverted. This must be attributed to the malnutrition (resulting from an inadequate blood supply) of the gastric and intestinal glands and of the nerves supplying them. For this reason it is a matter of great importance in arranging a dietary for an anemic case to carefully study the condition of the gastric function by means of test-meals and according to methods described in the Chapter of *Diseases of the Stomach*. The diet should then be accommodated exactly to the functional powers of the stomach and intestine.

Much albumen

Broadly speaking, the diet should contain an abundance of albuminous food. In cases of hyperchlorhydria this regulation is, of course, very easy to carry out. If there is a lack of hydrochloric acid, then the latter must be supplied if an albuminous diet is administered. Meats of all kinds, preferably raw or rare, fish, game, eggs, milk are all very useful articles of diet. In addition there should be plenty of fresh fruits and vegetables. Whether or not it is of advantage to give foods that contain relatively large quantities of iron is doubtful, because the amounts of iron contained in these foods can be more readily supplied medicinally; nevertheless, yolk of egg, spinach, apples and all articles that contain relatively large amounts of iron may without harm be liberally supplied. Carbohydrate foods, that is, cereals, bread, rice, potato, sweets should be given sparingly and fats should be given in moderation.

If the anemia is primarily due to some gastro-intestinal disorder, then exceptional care must, of course, be exercised in selecting a diet. This applies particularly to cases of anemia developing upon the basis of gastric or intestinal hemorrhage from ulcer. Here it may become necessary to put the stomach completely at rest for a time and to feed the patient exclusively by rectum. The technique of rectal feeding is fully described under *Stomach Diseases.*

Rectal feeding

Lack of appetite

Proper feeding in anemia is often rendered difficult because many patients with simple anemia suffer from lack of appetite. This element can usually be corrected by the use of bitter tonics, as tincture of cinchona, in doses of one to two drachms; tincture of nux vomica, five to twenty drops; compound tincture of cardamom, one to two drachms; or orexin, in five grain doses. Very often anemic patients are benefited by drinking on rising, and fifteen to twenty minutes before each meal, a glass of hot water containing one-third of a teaspoonful of bicarbonate of soda.

Rest

In severe cases of anemia rest, bodily, mental and psychic, is of the greatest importance. In the anemia following severe hemorrhage, either internal or external, rest in bed is absolutely essential. Here the limbs should be elevated and the head placed low so that blood, at all events, will reach the brain and the vital centres in the medulla. After the bleeding has been stopped, it often becomes necessary in patients who are very much exsanguinated to perform transfusion of normal salt solution, as described on page 74. If the facilities for transfusion are not immediately available, then what may be called auto-transfusion should be practised. This consists in wrapping bandages around the extremities, beginning at the distal end and wrapping towards the center. These bandages can be left in place for one or two hours. In this way enough blood is forced to the head, the medulla and the heart to sustain life; at the same time the patient should receive large amounts of water by rectum and, if he is conscious, by mouth. If collapse or heart failure threaten, then enemata containing alcohol (about two tablespoonfuls to the quart), or subcutaneous injections of ether or camphorated oil or of a 10 per cent. solution of camphor in ether, should be given. If necessary transfusion may be practised several times.

Management after hemorrhages

Cases of chronic anemia are very susceptible to temperature changes. This is due to the deficiency of hemoglobin in the blood, to the reduction of oxidative processes and hence impaired manufacture of heat and to the instability of the vaso-motor centers. Consequently anemic cases are particularly liable to catch cold, so that great care should be exercised in selecting sufficiently warm clothing and the proper foot-wear. Inasmuch as the loss of heat from the surfaces of the body is best prevented by creating an immovable layer of air between the skin and the first garment, a material should be selected that is a poor conductor of heat, that rapidly absorbs perspiration from the surface of the body and permits slow evaporation of the absorbed moisture. The ideal material is wool, for the fine hairs that are contained in wool garments effectively keep the clothing at some distance from the skin, while, at the same time, the rough character of the wool produces some irritation and friction of the skin and hence a slightly hyperemic condition which is grateful to anemic patients. The roughness of wool garments stimulates perspiration, but the porous character of wool causes rapid absorption of the moisture exuded from the sweat glands, while, at the same time, the sweat evaporates very slowly from the outer surface of the material; hence wool garments do not become saturated with moisture nor do they cling to the skin, so that they adequately protect the organism against loss of heat. In summer flannel and silk are less irritating to the skin and, at the same time, serve a useful purpose as bad conductors of heat. Linen and cotton underwear should never be worn by anemic patients (see also page 166). The foot-wear should be thick and the patient should wear woolen stockings during winter.

Clothing and footwear

On account of the susceptibility of anemic patients to temperature changes and particularly to cold, cold bathing should be absolutely forbidden. Even in neurasthenic and hysterical cases the use of cold or cool hydro-therapeutic measures that are otherwise so useful should be interdicted. Sea bathing is also absolutely detrimental to these cases. Hot baths, however, are very grateful and exercise a distinctly stimulating effect upon the metabolism, upon the circulation and upon the regeneration of the blood; they should therefore be advised.

Bathing

If anemic patients are to select a climate or a resort they should be sent to a moderate altitude, for a low barometric pressure stimulates blood regeneration. That the climate should be warm and that there should only be slight temperature changes is self-evident.

Climate and altitude

Medicamentous treatment

Iron and arsenic

Contra-indications for the use of iron and arsenic

The drug treatment of simple anemia consists chiefly in the use of iron and arsenic. There are, however, frequently very distinct contra-indications to the use of both these remedies; thus neither iron nor arsenic should ever be given if there are severe gastro-intestinal disorders, because both of these drugs, without question, have a tendency to irritate the stomach and the intestine. Nor should iron be administered to cases of anemia suffering from pulmonary tuberculosis. I believe that it occasionally aggravates the condition of these patients and even stimulates a latent or quiescent tuberculous focus in the lungs to renewed dangerous activity. It also occasionally seems to produce a rise of temperature. Trousseau claims to have seen pulmonary hemorrhage develop after the administration of iron in pulmonary tuberculosis. This observation has repeatedly been corroborated. I have never, personally, been able to convince myself of its truth. Arsenic is contra-indicated also in cases suffering from nephritis, for when the kidneys are diseased they eliminate the drug with difficulty and there is always danger both of irritating the diseased renal epithelia and of producing a cumulative arsenic effect.

Rectal and hypodermic administration

Gastro-intestinal disorders, therefore, should always first be treated and, if possible, cured, before iron or arsenic are given by mouth. In the meantime, both remedies may be administered by rectum, the iron in the form of dried blood or of reduced iron, or of tincture of the chloride of iron; arsenic preferably in the form of Fowler's solution. Arsenic may also be administered hypodermically in the form of the cacodylate of soda (see page 74).

Method of administering arsenic

In administering arsenic, the peculiarities and idiosyncrasies of the case must be carefully considered and the tolerance of each individual patient for the drug first carefully established. It is best, therefore, always to begin with small doses of arsenic and gradually to increase the quantity until the limit of tolerance is reached; to keep the patient for several weeks upon a quantity of arsenic slightly below this dose; and then to gradually reduce the dose again. For the details of the administration of arsenic, see *Pernicious Anemia* (page 73).

Method of administering iron

In administering iron it is important to remember that the patient should receive about 0.01 gm. of iron per day. The exact preparation of iron used is immaterial. Personally, I prefer reduced iron or the tincture of the chloride of iron to any of the organic preparations, for by employing simple inorganic products the dose can be much more accurately gauged. Iron and arsenic waters can also be employed in the treatment of simple anemia (see page 74).

It is best, in all cases of simple anemia, even after normal conditions in the blood have been re-established, to continue the use of small doses of arsenic and iron, that is, e. g., three to ten drops of Fowler's solution and two to six grains of reduced iron a day, for several months.

CHLOROSIS.

Definition

The most characteristic feature of chlorosis is the reduction of the hemoglobin in the individual red cells, combined with an increase of the blood plasma without any appreciable reduction in the specific gravity of the latter. The underlying taint seems to be more a perversion of lymph formation than of blood formation. There is no anatomical evidence of disease of the blood-forming organs nor are there very marked quantitative changes about the red blood corpuscles or the leucocytes, nor generally any signs of degeneration of the latter.

The neurosal element

We are justified in assuming that in chlorosis the interchange of the fluids between the blood and the tissues is altered (witness the great frequency of puffiness and edema), and this anomaly can best be explained by assuming a vaso-motor neurosis as the underlying cause. A strong neurosal element, moreover, enters into the clinical picture of chlorosis, manifesting itself not only about the vaso-motors of the body (remark the abnormal tendency to blushing and sudden pallor), but also in a variety of other manifestations that closely simulate the picture of hysteria. When we consider, finally, that the disease is most common in young girls during the period of adolesence, that it is frequently coupled with a variety of menstrual disorders, psychoses, perversions of the appetite, the sense of smell and taste and various secretory anomalies, we are justified in instituting causal treatment in chlorosis, more against the underlying neurosis than against the condition of the blood alone.

Causal treatment

The causal and prophylactic treatment, therefore, should concern itself chiefly with improving the general and personal hygiene of the patients, in properly feeding them, and in combating, with all the means at our disposal, the psychic and neurotic elements that so often predominate in this disorder.

Symptomatic treatment

The symptomatic treatment should be directed towards correcting the abnormal condition of the blood, and, by implication, towards relieving symptoms in various organs attributable to functional disturbances that are superinduced largely by the malnutrition either of the organs themselves or of the nerves supplying them.

Rest

One of the most important elements in the treatment of chlorosis is rest. The patients should be put to bed and kept there for several weeks at a time. If possible, they should be removed from their home surroundings and treated either in an institution or in some resort where they can enjoy a change of scene and can carefully follow the directions of the physician during the period of convalescence. Removal from home alone, combined with rest, often effects a cure.

Hydrotherapy

Combined with rest in bed certain hydriatic measures are of great use. Best of all are wet packs administered by wrapping the patient every morning in a linen sheet wrung out of warm water (90-96° F.) and allowing them to lie in this compress, covered with woolen blankets, for about half an hour.

Massage

Mild massage of the extremities and the abdomen is also exceedingly useful, both on account of its soothing effect on the nervous system and on account of its tendency to improve the circulation of lymph and hence promote the absorption of edemas.

Diet

In many cases of chlorosis there are secretory disorders of the stomach and not uncommonly muscular atony; thus gastroptosis, from relaxation of the abdominal muscles, is frequently combined with dilatation of the stomach from atony of the gastric walls. Stomach disorders are so common that some authorities have attributed the syndrome of chlorosis to the digestive perversions.

Gastric disorders

It is more probable, however, that the stomach disorder is either a part symptom of the general neurosis, or is directly attributable to the malnutrition of the gastric walls and the gastric glands, that results from the deficiency of hemoglobin in the blood. In each case of chlorosis a careful analysis of the stomach contents should be repeatedly made and the diet arranged accordingly, as outlined in the Chapter on *Diseases of the Stomach.*

Abnormal cravings

It is due to the variable character of the secretory perversion of the stomach also that chlorotic girls so frequently develop abnormal cravings; some seem to crave acids, others enjoy eating chalk, and it does not appear improbable that this is Nature's method of attempting to neutralize the lack of hydrochloric acid on the one side, or to counteract hyperchlorhydria on the other. Unless there is marked hypersecretion or hyperchlorhydria calling for a proteid diet and antacid medication, chlorotic patients do best on a diet consisting largely of vegetables and containing the minimum of meat.

Constipation

This régime is particularly useful because in most cases there is also atony of the intestinal walls with very obstinate constipation. This frequent occurrence of constipation has led to the theory that chlorosis is due to stasis of bowel contents and abnormal putrefaction in the intestine, in other words, that it is an auto-intoxication from intestinal poisoning. Here, again, it seems more probable that the constipation is the result, and not the cause, of the chlorosis, for many cases develop without bowel symptoms, and constipation is more frequently secondary to the chlorosis than vice versa.

The exact selection of the diet must therefore depend largely upon the shifting peculiarities of each individual case. Broadly speaking it should be nutritious and easily digestible, it should meet the state of the gastric and intestinal function and should above all take into consideration personal idiosyncrasies of the patient; for lack of appetite is one of the most distressing complications of the disease. One should never force a chlorotic to eat food that is distasteful, nor should one generally forbid indulgence in articles that the patients crave but that are otherwise harmless. If this liberal plan is adopted, co-operation on the part of the patient is always most readily secured.

Medicamentous treatment

Iron

The medicamentous treatment of chlorosis calls chiefly for iron, but this remedy can in no way be considered a specific for the disease, although it has frequently been so considered; for many cases of chlorosis get well without iron, provided the general treatment outlined above is carefully carried out; and, on the other hand, many cases of chlorosis fail altogether to respond to iron treatment alone. Iron, nevertheless, is by far the best remedy we possess in the treatment of chlorosis, and as it never does any harm it should be given in every case.

Mode of action

The mode of action of iron in chlorosis is very difficult to understand. Some of the iron is undoubtedly absorbed into the blood, but most of it is wasted in the stools; of the assimilated iron a part is built up into hemoglobin, a part stowed in the liver and spleen. One can hardly say that in chlorosis there is a deficit of available iron in the food and that the administration of iron by mouth supplies this deficit. The iron must rather be considered as a stimulant to the blood-forming organs.

Theories in regard to the action of iron in chlorosis

Bunge has advanced the theory that iron acts by combining with the sulphureted hydrogen that is generated by the putrefaction of albumens in the bowel, forming insoluble iron sulphid, and in this way protecting the organic iron compounds of the food and rendering them available; but there is little tangible evidence to show that this theory is correct; for, otherwise, any of the heavy metals that can combine with sulphureted hydrogen to form heavy sulphids should fulfill the same purpose, and this is not the case. Still others imagine that the iron, owing to its astringent properties, stimulates the gastro-intestinal mucosa to increased activity and hence improves nutrition. Immaterial what the theoretical indications for the use of iron preparations in chlorosis may be, the empiric fact remains that it is, in most cases, the sovereign remedy that can improve not only the condition of the blood, but also all the other disagreeable phenomena that complicate the disease picture of chlorosis.

Choice of iron preparations

Organic and inorganic compounds of iron

It is difficult to decide whether so-called organic or inorganic preparations of iron are more useful. Personally, I have never seen any reason to use other than the ordinary inorganic preparations, for there is no evidence to show that the numerous organic preparations of iron are either more rapidly absorbed or less irritating to the gastro-intestinal tract, or clinically more effective than the inorganic preparations. As a matter of fact, any iron preparation is converted in the stomach into the chloride; this usually combines with albuminous material to form an albuminate of iron, which, passing into the duodenum, is in part, as shown above, absorbed and deposited in the spleen and liver for future use, while the bulk is eliminated in the stools.

Blaud's pill

The best iron preparation of all is Blaud's Pill, containing sulphate of iron and the carbonate of potash. This pill acts beneficially, first, on account of the iron carbonate it incorporates, second, presumably, on account of the potassium it contains, for the latter is an important constituent of the red blood cells, and, finally, on account of its content of sulphuric acid which readily combines with toxic aromatic products derived from putrefactive processes in the bowel, converting them into non-toxic aromatic sulphates (indican and its congeners). The tragacanth, finally, that these pills incorporate possesses some laxative property which is useful. One to four pills may be given two or three times a day, preferably after eating. It is usually best to begin with small doses, say one pill three times a day, and then to gradually increase the dost until four or five pills are taken three times a day.

Perchloride of iron

Reduced iron

Another excellent iron preparation is the tincture of the perchloride of iron, which may be given in doses of from five to fifteen drops three times a day. This medicine should always be taken through a tube in order to protect the teeth. Reduced iron, in doses of one to five grains (0.05 to 0.3 gm.) in capsule, is also a very useful inorganic preparation.

Pill of aloes and iron

Citrate of iron and quinine

It is impossible to enumerate all the other preparations of iron that might be used. The three named above usually fulfill all the requirements. The Pill of Aloes and Iron may be mentioned, because it is particularly useful in chlorosis complicated with constipation. This pill contains sulphate of iron, the proper dose being four to eight grains three times a day. Another valuable official preparation is the Citrate of Iron and Quinine, containing 11½ per cent. of quinine and 14½ per cent. of iron, and given in doses of five to ten grains two or three times a day. The quinine in this pill is useful especially in cases that are characterized by great nervous asthenia, for the quinine undoubtedly acts as a cerebral tonic.

Organic preparations

Ferratin
Carniferrin
Hemoglobin
Peptonates of iron

Iron and manganese

Among the organic preparations the following may be enumerated, although, as stated above, none of them, in my opinion, possesses any advantage over the inorganic preparations, none is so reliable, so stable or so inexpensive. Ferratin, in doses of from eight to twenty grains (0.5 to 1.3 gm.) per diem. Carniferrin, containing 35 per cent. of iron and combined with sarcinic acid, and given in doses of from five to ten grains (0.3 to 0.6 gm.) three times a day. Hemoglobin itself may also be used. The various albuminates and peptonates of iron possess no particular advantages. The administration of iron in combination with manganese is no more effective than the administration of iron alone, although extravagant claims have been made for this therapy.

Contra-indications to the use of iron

There are certain contra-indications to the use of iron and there is occasionally difficulty in administering it; thus in very severe dyspeptic disorders, such as we not uncommonly see in chlorosis, iron occasionally aggravates the gastric symptoms. In such cases the dyspepsia should first be treated, as described in the Chapter on *Diseases of the Stomach,* and iron not given by mouth until the gastric symptoms are relieved; if need be iron may here be given by rectum, in the form of the tincture of iron in starch enema. Occasionally cases of chlorosis suffer from severe gastralgia, which is markedly aggravated by the administration of iron; in such cases the hyperesthesia of the stomach should be first treated by the use of hot applications to the epigastrium, a milk diet, small doses of cocaine, as described on page 19, or of silver nitrite (see index); or memthol, preferably combined with some alkali may be given in small doses (0.05 to 0.1 gm.) a day.

Iron waters

The use of iron waters is occasionally beneficial, especially if the waters can be taken at the resort where the iron source is. The use of bottled iron waters, however, is, as a rule, useless, because most natural iron waters contain the iron in solution as a carbonate; when they are bottled the carbonic acid evaporates in great part and the iron precipitates out, so that the water itself contains practically no iron. This objection does not, however, apply to waters containing the sulphate or chloride of iron.

Arsenic

Arsenic is less important in chlorosis than in other forms of anemia. As it possesses a general tonic effect in small doses, its administration, however, can do no harm. It is best given in the form of Fowler's solution, beginning with small doses, e. g., three to five drops in plenty of water three times a day and increasing the dose a drop a day until fifteen to twenty drops are being taken in the twenty-four hours; and then the dose should gradually be reduced, and, if necessary, a second course of this kind instituted. The existence of dyspeptic symptoms, however, is a distinct contra-indication to the use of arsenic in chlorosis.

Dyspnea
Palpitation

Symptomatic treatment of the cardio-vascular signs is rarely necessary, because they improve under rest and iron. The dyspnea, therefore, and the palpitation (see page 65) that these patients complain of rarely calls for special treatment.

Bleeding
Sweating

A word of warning may be uttered in regard to the dangers of bleeding cases of chlorosis, a practice that has recently become popular again. The plethora is removed only for a short time by venesection; and in chlorosis especially, owing to the disturbed vaso-motor tone, a reactive outpouring of fluid into the blood soon occurs, so that the purpose of the bleeding is immediately counteracted or even over-balanced and nothing is gained. The one possible benefit that could accrue from bleeding must be attributed to the profuse perspiration that usually follows venesection in chlorosis; but this beneficial stimulation of the lymph flow, and the loss of fluid through the sweat glands, can be produced much more easily by hot baths or hot air. Sweating, therefore, is often useful in chlorosis for it promotes concentration of the blood and hence better nutrition because each unit volume of blood contains more hemoglobin. In chlorosis particular care, however, must be exercised to prevent cerebral anemia from sweating by heat, so that this treatment should never be instituted with the patient sitting up, and cold applications should always be made to the head while the patient is being sweated.

II. LEUKEMIA.

Leukemia and pernicious anemia
Leukanemia

Although the blood picture of leukemia differs altogether from that of pernicious anemia, the two classes of blood disorder, nevertheless, must be considered as pathogenetically related; for in both instances we have some noxious agency, presumably toxic in character, affecting the blood-forming organs and chiefly the bone-marrow. Occasionally individual cases are seen in which both the red and the white cells are simultaneously affected, so that a disease is produced that occupies an intermediary position on the border line between pernicous anemia and leukemia. This has been called leukanemia (Leube).

Causal treatment

The causal treatment of leukemia is therefore the same as that of pernicious anemia, in both cases unfortunately equally unsatisfactory, because in neither case do we know where to concentrate our attack. In leukemia, in fact, we know even less what *indicatio causalis* to meet than in pernicious anemia. Nevertheless, every effort should be put forward to look for a possible cause and particular attention should be bestowed above all upon bowel antisepsis and the removal of intestinal parasites. Free evacuation of the bowel contents, and treatment directed towards any systemic disorder (syphilis) that may be present and that might even remotely be accused of causing the leukemic blood picture, should be energetically instituted.

Splenic, lymphatic myelogenous leukemia

The treatment, causal and symptomatic, of the different forms of leukemia is the same. The old pathogenetic differences between splenic, lymphatic and myelogenous leukemia that have been formulated have only an anatomic interest and can no longer be recognized as useful for clinical differentiation. The preponderance, in individual cases, of lymphatic or of splenic swellings is nowadays considered to be of subordinate importance; for hyperplasia of the spleen or lymph glands, or of both, occurs both with and without lymphocytosis (pseudo-leukemia, see next chapter). On the other hand, leukemia may occur with myeloid degeneration of the bone-marrow and no splenic or lymphatic swellings. We can conclude from this that in leukemia, as well as in pernicious anemia, the inflammation of the bone-marrow is after all the most important and presumably the determining factor. For clinical purposes it is simpler and more exact therefore merely to speak of a *lympocytic* and a *leucocytic* leukemia, indicating in this way that in the former case the lymphocytes predominate in the blood, in the latter the leucocytes, i. e., neutrophile, eosinophile, polynuclear and mast cells.

Lymphocytic and leucocytic leukemia

Limitations of treatment in leukemia

Leukemia, as far as we know, is presumably never cured, but life can be prolonged, and long remissions with improvement of the blood picture and great symptomatic relief can be brought about, by judicious treatment. The use of remedies in leukemia should be carefully instituted. Whenever any drug is given the effect should always be carefully watched, for leukemic patients, possibly owing to the perversions of their leucocytic (antitoxic) function seem to be particularly susceptible to drug intoxications; moreover, they frequently suffer from dyspepsia and diarrhea, all elements that render them especially liable to drug poisoning and that should be included in the calculation both in prescribing drugs and in ordering the diet.

Care in giving drugs to leukemic patients

Arsenic

The remedy that seems of the greatest value in leukemia is arsenic. It should be given as in pernicious anemia (see page 73). Provided the gastric functions are normal it may, however, with care be given in somewhat larger doses at first in leukemia than in anemia. It is usually safe to begin with three times fifteen drops of Fowler's solution a day during the first week, giving three times twenty drops during the second week, three times twenty-five drops during the third week and, if no toxic symptoms appear, three times thirty drops during the fourth week. This dose should be continued for some time until favorable changes appear in the blood picture, and it may then be gradually reduced by stages. Several courses of arsenic should be given. It is occasionally good practice to change the preparation of arsenic and to alternate with the use of Fowler's solution, sodium arseniate and sodium cacodylate (see page 74).

Dose and administration

Sodium arseniate
Sodium cacodylate
Injection of arsenic

The injection of arsenic into the lymph glands or into the spleen is to be condemned in leukemia (see also page 89). The effects produced by this treatment have never been favorable and, *per contra,* much damage has been done. (Subcutaneous inflammation and necrosis; infarction and other mechanical injury to the lymph glands and to the spleen; rupture of the spleen; severe hemorrhages; have all been reported.)

Quinine
Phosphorus
Iodine

Quinine has also been recommended very warmly in the treatment of leukemia. It may be given as the muriate of quinine, in doses of five to fifteen grains (0.3 to 1.0 gm.) three times a day, preferably in combination with arsenic or iron. Phosphorus, too, is occasionally of value in leukemia. A very useful prescription is the syrup of iron phosphate with quinine and strychnia. It may be given in half or teaspoonful doses, three or four times a day. Iodine and the iodides are no longer used in leukemia although at one time they were considered to be efficacious.

Extracts of spleen
Lymph glands
Bone marrow

Extract of spleen, lymph glands and bone-marrow are extensively used in leukemia. I have never been able to convince myself of their efficacy; nevertheless, there can be no harm in employing them, as some reliable authorities claim to have seen benefits accruing from their administration. All conclusions, however, in regard to the efficacy of these, or, for that matter, of any other remedy in leukemia must be very conservatively interpreted, because the disease has a natural tendency to spontaneous remissions.

Oxygen

The inhalation of oxygen occasionally affords symptomatic relief, especially in cases with severe dyspnea and cardiac weakness. At least 100 to 150 litres of the gas should be given during twenty-four hours, if any good effects are to be expected.

The fact that leukemia occasionally seems to improve if the subjects develop some intercurrent infectious disease, chiefly erysipelas and tuberculosis, has been utilized therapeutically.

Tuberculin and erysipelas antitoxin have been injected in some cases with good temporary results. This method, however, is exceedingly precarious, and until further reliable data in regard to its efficiency shall be forthcoming it is best to suspend judgment in regard to its use.

Tuberculin
Erysipelas antitoxin

Local treatment is to be absolutely condemned. At one time it was fashionable to inject arsenic or ergot into the lymph glands or the spleen, to perform galvano-puncture or even to practise extirpation of large lymph glands or of the spleen. Lymph gland excision has never produced any good results in leukemia. The practice, moreover, is irrational, because, as stated above, the primary affection must not be sought for in the lymph glands, but rather in the bone-marrow. All the cases in which the spleen was excised died very shortly, probably sooner than they would have died without splenectomy, so that even this operation, however useful it may appear for the purpose of relieving great intro-abdominal pressure when the spleen obtains enormous dimensions, must be considered unjustifiable.

Injections of ergot into lymph glands
Galvano-puncture
Extirpation

Splenectomy

The diet in leukemia should take into consideration the state of the digestive apparatus, but, broadly speaking, should be abundant and highly nutritious, and should consist largely of nitrogenous material; and every effort should be put forward to maintain adequate nutrition, in order that the patient may possess the greatest resisting powers to combat the inroads of the disease.

Diet

Symptomatic treatment of the dyspepsias, of the hemorrhages, of cardiac weakness, are spoken of in the Sections on *Diseases of the Stomach and Intestine*, the *Hemorrhagic Diathesis* and *Diseases of the Heart.*

Symptomatic treatment of complications

For the profuse sweats that frequently torture leukemic patients alum applied to the surfaces of the body in one per cent. solution; or camphoric acid, given by mouth, in doses of from fifteen to thirty grains (1 to 2 gm.) in capsule, or atropin one-two-hundred-and-fiftieth grain (¼ mg.) repeated, by mouth and hypodermically; or the extract of belladonna, in quarter to one grain doses, or finally, agaricine, in doses of one-twelfth to one grain (5 to 60 mg.) in pills, repeated, may be used.

Treatment of sweating in leukemia

III. PSEUDO-LEUKEMIA.

The prefix "pseudo" placed before the name of a disease is intended to designate a special syndrome that differs from the disease it simulates; pseudo means false. There cannot, however, be a false leukemia but there can be a false name, and pseudo-leukemia is in fact merely a designation for a variety of

Nomenclature and definition

diseases that resemble leukemia in some of their manifestations but are not leukemia.

Inasmuch as in leukemia swelling of the lymph glands and the spleen is common, many different disorders that lead to lymphatic and splenic enlargements without the characteristic blood picture of leukemia, have been grouped under the name of pseudo-leukemia. In some of these disorders the lymph swellings predominate; in others the splenic tumor. All show the blood picture of a simple anemia, occasionally also a lymphocytosis. Rarely, pseudo-leukemia develops into true leukemia, then namely, as shown in the previous sections, when the bone-marrow becomes involved in the disease process.

Hodgkin's disease

Splenic anemia

Banti's disease

Pseudo-leukemia Spleno-lymphatica

If the lymph swellings predominate we speak of *pseudo-leukemia lymphatica* (Hodgkin's disease); if the splenic tumor is particularly developed of *pseudo-leukemia splenica*, or *splenic anemia;* when it appears combined with hepatic cirrhosis and simple anemia, of *Banti's disease.* In all cases both the spleen and the lymph glands are probably involved to some extent; if they are both equally involved we speak of *pseudo-leukemia spleno-lymphatica.*

Recurrent glandular fever

Tuberculous adenitis

Scrofula

Sarcomatosis of lymph glands

Again, the lymphatic swellings may be accompanied by a remittent or intermittent type of fever, then we have *recurrent glandular fever;* this form is presumably a *tuberculous adenitis,* and as a matter of fact many cases of multiple tuberculous lymph gland swellings, as well as *scrofula,* are often included under the head of pseudo-leukemia. The same applied to *multiple sarcomatosis of the lymph glands,* that often cannot during life be distinguished from simple lymphadenomata.

Etiology

It will be seen, therefore, that the term pseudo-leukemia covers a multitude of different clinical entities, many of them of unknown etiology. Some of the cases seem to develop on the basis of tuberculosis or malaria, others after diseases of the tonsils and pharynx, after measles, whooping cough and especially influenza. Given an inherited or acquired syphilis, vulnerability of lymphoid tissue, then a variety of noxious agencies seem capable of producing general lymphadenitis and splenitis. What factors determine this disposition and what noxious agencies become operative to cause the swellings, whether they are infectious or toxic, endogenous or exogenous, we do not always know.

Causal and prophylactic treatment impossible

It is clear, therefore, that effective *causal treatment and prophylaxis* of the various forms of pseudo-leukemia is, in the obscurity of our present knowledge, impossible.

Symptomatic treatment

Symptomatic treatment is, however, often efficacious in reducing the glandular swellings and the splenic tumor, especially early in the disease, and in correcting the anemia that usually complicates this disorder. With the reduction of the tumors most of the pressure symptoms produced by them promptly yield so that the latter rarely call for special treatment.

Arsenic

Sodium cacodylate

The chief remedy, again, is arsenic, employed as described under *Leukemia*, i. e., either in the form of Fowler's solution, or as arsenious acid, or in the form of the Asiatic pill (see page 73). All these arsenic preparations, if given by mouth, should be administered after eating. In pseudo-leukemia sodium cacodylate (sodium dimethyl arseniate) is also a useful remedy. It contains nearly two-thirds parts of arsenious acid and seems to be less irritating to the stomach than Fowler's solution or the ordinary arseniate of soda. It should be administered in pill form, each pill containing from one-sixth to one grain (0.01 to 0.06 gm.). From one to six pills a day may be safely administered, or a watery solution may be employed in the strength of one to fifteen, from five to twenty-five drops a day being given of the latter. After the use of cacodylate of sodium the patients very soon develop a characteristic odor of garlic on the breath.

Intra-parenchymatous injections of arsenic

Technique Fowler's solution

Solution of sodium arseniate

Sodium cacodylate

Whereas, in leukemia, the sub-cutaneous or intra-parenchymatous administration of arsenic in any of its forms is to be condemned as useless, irrational and dangerous, in pseudo-leukemia it occasionally acts beneficially. One may either give Fowler's solution or sodium arseniate. If Fowler's solution is used, either for injection into lymph glands or into the muscle tissue, preferably of the gluteal and anterior abnominal region, it is best to administer it diluted in the proportion of one to three with water to which one-half per cent. of carbolic acid is added as an antiseptic. Of this solution about ½ cc. should be injected at a time in the beginning, and the dose gradually increased later on if no untoward symptoms develop. Better than Fowler's solution for injection is sodium arseniate. This is prepared as follows: 1.0 gm. of arsenious acid is boiled with 5 cc. of normal sodium hydrate solution until a clear solution is obtained, and 600 cc. of distilled water are then added. In using this solution for injection a Pravaz syringe is filled one-half with water and one-half with sodium arseniate solution and about 1 cc. of this mixture is injected into the enlarged lymph glands. Still another useful preparation for hypodermic use is a 10 per cent. solution of sodium cacodylate of which half a Pravaz' syringe full is injected at a time.

Quinine-phosphorus

Iodide of potash

The indications for the use of quinine and phosphorus are the same as in leukemia. These remedies act as general tonics and occasionally do some good. Iodide of potash also has a place in the treatment of pseudo-leukemia; it should be given in the form of the saturated solution, in gradually increasing doses. In general tuberculous adenitis I consider this drug dangerous; one should, therefore, always be quite sure of one's diagnosis before employing it.

Local applications
Sapo kalinus
Iodoform

For local application the best remedy is green soap (sapo kalinus viridis) or sapo kalinus. Of this about a teaspoonful is daily rubbed into the skin over the affected glands. Occasionally the addition of iodoform to this soap is of use; for the alkali in the soap loosens the epidermis and permits the free entrance of iodoform into the tissues surrounding the affected gland. A very good mixture is:

℞

Iodoform,	5 gm.
Sapo kalinus,	
Vaselin,	āā 20 gm.
M.	

Iron and arsenic for the anemia

In view of the simple anemia that is generally present, iron, as described in the part on *The Anemias,* is indicated. One can conveniently combine iron and arsenic by giving the cacodylate of iron, thus:

℞

Cacodylate of iron,	1.0 gm.
Cinnamon water,	25. cc.

M. S. Fifteen to fifty drops three times a day, after meals.

Indications for gland extirpation

In case all these medicinal measures, combined with proper feeding and ideal hygienic conditions, fail to cause the disappearance of the glandular swellings, and especially if certain glands, by mechanically compressing important nerve branches or blood vessels, produce disagreeable secondary symptoms, then extirpation of the glands becomes necessary. Some clinicians go so far as to claim that the excision of a few of the enlarged glands exercises a beneficial effect upon the whole disease process. Others, again, claim that excision *per contra* occasionally produces an aggravation of symptoms and accelerated growth of the remaining glands. For the purpose, therefore, of influencing the disease process, gland extirpation is probably a doubtful, possibly a precarious, procedure, and the only real indication for performing this operation is the relief of pressure symptoms.

Treatment of splenic anemia

In cases of splenic anemia, i. e., pseudo-leukemia in which the spleen enlargement predominates over the lymphatic swellings, arsenic, iron and the other medicines recommended above are also indicated. Injections of arsenic, however, into the spleen itself are always a dangerous procedure and have so far never produced results sufficiently favorable to warrant their recommendation. On the contrary, disagreeable and dangerous results have often followed this practice so that it is to be condemned as useless and unwarranted.

Cold to the spleen

The application of green soap, or of any other remedies, over the splenic region, excepting as counter-irritants to relieve pain, is useless. Electrization of the spleen, which has also been recommended, is altogether without effect. Cold continuously applied to the splenic region occasionally produces at least symptomatic relief and has been known to reduce the splenic swellings. The ice bag intermittently applied is probably the best and simplest method of producing this result.

Quinine Eucalyptus

A variety of remedies have, at different times, been recommended for reducing the splenic tumor, chief among them being quinine and eucalyptus. These remedies, however, presumably exercise their good effect only in cases of large malarial spleen, and they should therefore only be used if the existence of malaria can be determined by examination of the blood; otherwise they are useless.

Splenectomy

Excision of the spleen has been frequently performed, and in some cases this operation has been followed by very favorable results, especially if splenectomy was performed relatively early in the disease. The main indications for splenectomy in advanced cases are pressure symptoms due to the often enormously enlarged organ; if many lymph glands are involved at the same time the results are far less favorable. The operation, of course, is not without dangers, especially if adhesions have formed in the region of the spleen. The existence of a cirrhosis of the liver is always a contra-indication to splenectomy; consequently in Banti's disease this operation should not be performed.

THE X-RAY TREATMENT OF PSEUDO-LEUKEMIA AND LEUKEMIA.

(Dr. W. A. Pusey, Chicago.)

Pseudo-leukemia

In pseudo-leukemia the glands may be made to disappear under X-rays. This happens not only with superficial glands, but it also happens with glands in the pelvis and in the mediastinum. Where there is cachexia this gradually disappears as a rule *pari passu* with the disappearance of the glands. The improvement is prolonged, but recurrences are apt to take place. Of the first two cases treated with X-rays, one has had two serious recurrences in this time, but these have promptly yielded to X-rays, and he has been able to pursue an arduous occupation with the loss of not more than two months' time in the last four years. The other case had a recurrence within a few months, for which an operation was performed, and he died of aspiration pneumonia.

Leukemia

Most of the cases of leukemia treated were spleno-myelogenous; a few were lymphatic. The results in both types have been about the same. The effect on the glands, including the spleen, is practically the same as in pseudo-leukemia. In numerous cases spleens filling a large part of the abdominal cavity have diminished until they were hardly palpable. In other cases, however, the diminution in the spleen while marked was not so great. The changes in the lymphatics may or may not be accompanied by corresponding improvement in the blood. As a rule the blood rapidly improves, and may return to normal in its cellular composition. The cells which are slowest to disappear are the myelocytes; in some cases their percentage will remain high even after the blood otherwise has become normal. In most cases the improvement in the cachexia is more rapid than the improvement in the condition of the blood, and in many cases, in which the changes in the blood was relatively slight, the improvement in physical vigor has been great.

The persistence of the results in leukemia is not as long as in pseudo-leukemia. The disease may be expected to recur, but in many instances the relapses may be treated successfully. There are on record at the present time several cases which, with periods of treatment at intervals of a few months, have remained in a fair state of health for two or three years.

Spleno-megaly

I have treated one case of spleno-megaly without blood changes other than anemia. In this case the spleen extended from the brim of the pelvis to the diaphragm, and a hand's breadth to the right of the umbilicus. This spleen diminished with great rapidity so that within six weeks it was just palpable under the border of the ribs; the patient's general physical condition improved so greatly that he was able to resume his occupation and remained in good condition a year later and has, I believe, thus far had no relapse.

IV. THE HEMORRHAGIC DIATHESIS.

Classification
Scurvy
Hemophilia
Purpura

There are a number of diseases of obscure origin that are characterized by the occurrence of hemorrhages in various organs. The chief representatives of this group are *scurvy*, *hemophilia*, and *purpura*. This classification is more or less arbitrary and the three disorders are closely related and occasionally merge into one another. Hemophilia, in the overwhelming majority of cases is due to a transmitted hereditary taint and is a permanent condition, whereas scurvy and purpura rheumatica are acquired, the former often occurring endemically, usually as the result of malnutrition with severe general disturbances; the latter always occurring sporadically, generally without severe systemic disturbances and rarely dependent upon definite external conditions. Even in scurvy and purpura, however, one is almost forced to the conclusion that a congenital predisposition to hemorrhages exists by the occasional appearance of scurvy or purpura in subjects who are healthy and in whom none of the predisposing or determining factors that are usually incriminated with producing these diseases are operative. The diseases grouped under the name of the hemorrhagic diathesis, especially, nowadays, scurvy, are fortunately very rare, so that their treatment is relatively of subordinate importance and may hence be discussed very briefly.

SCURVY.

Causal treatment

A number of theories in regard to the causes of scurvy exist. There seems to be no doubt that food factors play an important rôle in its production. The absence of potassium salts, the excessive ingestion of salted foods, the lack of sufficient vegetables and fruits, the lack of fat in the diet have all been accused of producing the disease. At all events, in the practical treatment of the disease fresh vegetables containing potassium salts, viz., chiefly potatoes, cabbage, spinach, watercress, carrots, turnips, onions, artichokes, asparagus, oranges, and in addition milk, fresh meat, containing the blood, and meat extracts should above all things be immediately supplied. As a rule a scorbutic patient if placed at rest and fed on a diet of this character will recover without further medicamentous interference.

Diet

Rest

Prophylaxis

As a prophylactic measure the use of lemon or orange juice has been recommended, especially in children who are fed upon artificial foods lacking so-called anti-scorbutic elements, and in individuals, like sailors or arctic explorers, who are forced to live for long periods of time upon a diet consisting largely of preserved foods. In the English navy, for instance, it is a compulsory rule that the sailors be given every day a lemonade consisting of 14 gm. of lemon juice, 429 gm. of sugar and 112 gm. of water, at dinner.

Hygiene

The establishment of ideal hygienic conditions is also of great importance. There seems to be no doubt that lack of light and fresh air, exposure to cold and dampness and lack of proper exercise all contribute towards the outbreak of scurvy, especially when many subjects are massed together in one dwelling for long periods of time.

orseradish

Aromatic tonics

Yeast

Of remedies that have been recommended herba cochleariæ (Horseradish) was for a long time the most popular one. Aromatic tonics, tannic acid, quinine and many other remedies have been recommended, but it is generally unnecessary to give these medicines excepting to stimulate the appetite, or as general tonics. Yeast, too, is advised in doses of 200 to 300 gm. daily.

Treatment of the gums

Particular attention must be paid to the laceration of the gums, for this is one of the most distressing symptoms of the disease. Here certain washes are necessary. Peroxide of hydrogen may be applied directly to the gums, or a permanganate solution, 1 to 300, or a solution of silver nitrate, five grains to the ounce, or chlorate of potash solution, 1 to 50, or equal parts of the tincture of myrrh and catechu. In addition the teeth should be carefully looked after and mechanical irregularities corrected. For the gum hemorrhages adrenalin, in 1 to 1000 solution, or cocaine (10 per cent solution), or iron perchloride (concentrated solution), or gelatine 10 per cent (*sterile*) are probably the best remedies.

Surface hemorrhages

Styptics by mouth

The same local treatment may be used in surface hemorrhages in other parts of the body. In bloody infiltration of muscles the application of a hot mixture of vinegar, one part, and water, two parts, is frequently very grateful. Occasionally ice applied to the bleeding area, or swallowed, in case of gastro-intestinal hemorrhage, is useful. The internal administration of styptic drugs like ergot, chloride of iron, etc., is useless. Occasionally pressure bandages or tamponade become necessary to stop hemorrhages. Surgical measures are always dangerous owing to the hemorrhagic tendency that exists. Great care should also be exercised in the use of drastic purges or other drugs that stimulate violent peristaltic movement, for bowel bleeding may occasionally be produced by their administration.

HEMOPHILIA.

Prophylaxis

Marriage

In view of the hereditary character of this disease and the transmission of the disorder through the females of the family, immaterial whether they be hemophilic themselves or not, marriage of the women of "bleeder" families should always be forbidden. Male members who are not hemophilic, however, may marry. If it is known that at one time in the family history of a hemophilic man hemophilic children were born from a hemophilic father, then the male members of such a family likewise should be advised against marriage.

Individual prophylaxis

Danger of minor operations

Individual prophylaxis in all members of a bleeder family is very important, especially during childhood and early adolesence. Thus all operative inroads, however slight they may be, should be avoided during childhood, as circumcision, the removal of moles, cutting of the frenum of the tongue, perforating the ears. Vaccination, however, seems to be without danger in hemophilia, so that the children can be given the benefit of protective inoculation against smallpox.

Care of the teeth

The care of the teeth is, of course, of the greatest importance and even slight defects should be treated with the object in view to prevent the necessity of tooth-extraction. Leeching, cupping and vesication should never be practised in children from hemophilic families.

The toys that they are permitted to play with should be of such a character that the children cannot injure themselves. Violent gymnastic exercises, in fact, any pursuit that can lead even to slight surface abrasions or other bodily injury should be forbidden. In choosing a calling some occupation should be selected that does not necessitate contact with machinery or the use of sharp tools.

Diet

The diet in hemophilia should consist largely of vegetables and should be selected approximately on the same principles as the diet in scurvy (see page 95). Alcoholics, tea and coffee, condiments and spices should be reduced, in fact, nothing should be eaten that can irritate the cardio-vascular apparatus.

Medicamentous treatment

Lemons

Mineral acids

A great number of remedies have been recommended for the cure of the hemophilic tendency, while but few of them have vindicated the claims advanced for them by the different clinicians who have advised their use. The laity have great faith in the use of large quantities of lemons or of other citrous fruits, and some clinicians report good results from the continued use of citrates. Mineral acids, too, deserve a trial, preferably sulphuric acid, either as acid sulph. dil., ten to thirty drops sev-

Sulphates

eral times a day, or as acid sulph. aromat., five to fifteen drops. Magnesium and sodium sulphate are also spoken of favorably, the latter remedies possibly acting beneficially from the sulphuric acid they contain, and through their effect upon the bowels; that is, by promoting watery evacuation and hence possibly greater concentration of the blood and also by counteracting the absorption of bowel poisons.

Ergot
Lead acetate
Hydrastis
Opiates

Ergot, lead acetate, hydrastis, opiates, have all been recommended, but opinion seems to indicate that they are of no value in hemophilia.

Treatment of hemorrhages by surgical means

Hemorrhages, when they occur, must be treated chiefly mechanically and according to surgical principles, i. e., the bleeding part must be elevated, compression applied above the bleeding area and occasionally a ligature placed about the afferent artery; thus a case of severe hemorrhage in a hemophilic following the extraction of a tooth is reported in which the common carotid had to be ligated before the bleeding stopped.

Subcutaneous injection of gelatine

The subcutaneous injection of gelatine may also be tried. A 2 to 3 per cent. neutralized solution of *sterile* gelatine in physiological solution should be heated to body temperature and from 5 to 200 cc. injected under the skin (technique, see *Aneurism of the Aorta,* page 58). This occasionally stops the bleeding.

Calcium chloride

Calcium chloride, to judge from the case reports that have been published, is of no value.

Surface hemorrhages and bleeding into cavities

Surface hemorrhages should be treated as described under *Scurvy.* Joint hemorrhages and hemorrhages into the various serous cavities of the body (pericardium, pleura, peritoneal cavity) epistaxis, etc., call for special treatment, the details of which are described in their appropriate places.

PURPURA.

Nomenclature

Various forms of purpura have been distinguished under the names of purpura simplex, purpura hemorrhagica, purpura rheumatica, syn. peliosis rheumatica or Schoenlein's disease, and Morbus Maculosus of Werlhoff. All forms of purpura are closely related and the clinical differences are very artificially constructed. At the bottom of all these disorders is a hemorrhagic diathesis, i. e., generally a pale, tender, vulnerable skin with a tendency to bleeding, and usually an anemic condition of the blood. Such individuals are particularly susceptible to temperature changes and hence to rheumatoid disorders, so that the simultaneous appearance of hemorrhages, joint exudates and muscle pains is not to be wondered at (hence the name "purpura rheumatica").

The cause of these disorders is not definitely known. Some cases seem to be due to an infectious agent (bacillus purpuræ, Letzerich); in others a ferment intoxication is probable causing chemical blood changes; in still other, more chronic forms, the blood vessel walls seem to be particularly affected (endarteritis with hyaline or fatty degeneration of the muscular layers and fragility of the walls). Some cases seem to accompany chronic nephritis, especially with pronounced cardio-vascular manifestations; here again a weakening of the vessel walls engrafted upon the hemorrhagic diathesis may be incriminated.

Symptomatic multiple hemorrhages due to sepsis

From a therapeutic standpoint it is very important to distinguish true purpura from symptomatic multiple hemorrhages due to sepsis or accompanying a variety of infections or intoxications (small pox, petechial typhus, cholera, plague, yellow fever, anthrax, acute yellow liver atrophy, phosphorus poisoning, icterus gravis, snake poisoning, pernicious anemia, etc.). In the septic form of multiple cutaneous hemorrhages one frequently finds ulcerative endocarditis with secondary multiple septic emboli in the capillaries of the skin and other portions of the body; there is also a so-called purpura gonorrheica closely related to the above. None of these forms constitute true purpura, although this name is often falsely given them.

Causal treatment of the above

The treatment here must be directed principally against the underlying disorder of which the hemorrhages are merely an unimportant, and by no means a constant, manifestation.

Symptomatic treatment of purpura

The treatment of true purpura, in view of our ignorance in regard to its etiology, must unfortunately be largely symptomatic. During the periods of remission that occur, the patient should, above all things, be protected from catching cold; hence life in a warm climate is to be recommended whenever feasible. Hygienic conditions should be perfect, and above all nervous or emotional shock or over-strain should be strenuously avoided, for in some cases sudden fright or anger have been known to precipitate attacks.

Diet

The treatment of the attack always calls for rest in bed. The diet should be bland and should be similar to that described in the other manifestations of the hemorrhagic diathesis. Coffee, tea, alcoholic liquors, spices, condiments and all other articles that can excite the vasomotors should be omitted. For a time, especially in the beginning, milk and cream with some bread or cereal and a little lemonade or orangeade should constitute the food.

Regulation of the bowels
Intestinal hemorrhage

Particular care should be devoted to the regulation of the bowel function, and the stools should be carefully examined for the appearance of blood, denoting intestinal hemorrhage, which would require special treatment (see index). Intestinal parasites, that have been accused of some rôle in the production of the disease, should always be looked for and should be removed, if present, as described in the Chapter on *Intestinal Diseases.* There is no specific remedy but, according to most authorities,

Sulphuric acid

sulphuric acid has been declared a very useful drug. It may be given as acid. sulph. dil. in ten to thirty drop doses, or as acid. sulph. aromat. in five to fifteen drop doses, in water, several times a day.

Fowler's solution

Fowler's solution is always indicated and should be given as described under *Pernicious Anemia.*

Ergot

Ergot, in the form of the fluid extract, in the dose of ten to thirty drops, repeated, is warmly recommended, especially in children.

Ol. terebinthinae

Oleum terebinthinæ rect. (dose ten to fifteen drops) is endorsed by no less an authority than Litten.

Chloride of iron

Hydrastis

Chloride of iron in doses of one to five drops a day, in milk, or the extract of hydrastis, in doses of twenty to thirty drops every three or four hours, are also spoken of favorably.

Anti-rheumatic treatment

In all cases of purpura with marked rheumatic manifestations (peliosis rheumatica) an anti-rheumatic treatment should be instituted, as mentioned in the part on *Rheumatism* (see page 169). It will generally be found that the pain in the muscles and tendon sheaths as well as in the joints stops as soon as the hemorrhages into the joints occur.

Hemarthrosis

Serous hemorrhage

Epistaxis

The special treatment of the hemorrhagic joints (hemarthrosis), of blood extravasations into the serous sacs, of nose bleed, etc., that occasionally occur in this, as in all the other manifestations of the hemorrhagic diathesis, are discussed in full in the sections on the different organs affected.

CHAPTER III.

DISEASES OF THE DUCTLESS GLANDS

I. DISEASES OF THE THYROID GLAND.

MYXEDEMA AND CRETINISM.

The function of the thyroid gland is either nutritive or antitoxic, i. e., it either supplies something to the blood that is necessary to normal life or it removes something from it that is harmful.

Effects of removal of the thyroid

Removal of the thyroid is followed within a few days, or after a longer time (as late as nine months), by anemia and oligemia. There is often an initial rise of temperature, usually followed by a descent to subnormal. In young animals the growth of the bones is retarded and various trophic disturbances develop, the rate of respiration increases, a variety of nervous phenomena are observed that may be either irritative or depressive in character, viz., about the motor sphere, fibrillary twitching of the muscles followed later by tetany, contractures or paresis; and in the sensory sphere, first hyperesthesia and later diminished sensibility; and about the heart palpitation and tachycardia.

Myxedema

Clinically, a similar syndrome is presented in myxedema (synonyms, *sporadic* or *endemic cretinism*) and in cretinism (synonyms, *infantile* or *fetal myxedema, myxedematous idiotism, athyreosis chronica*), as well as in operative removal of the thyroid gland (*cachexia thyreopriva* if the normal gland is removed, *cachexia strumipriva* if the diseased gland is removed). The conclusion is, therefore, self-evident that these diseases are due to suppression of the thyroid function.

Here, therefore, the administration of thyroid gland is the sovereign remedy and the results obtained from this treatment are among the most brilliant achievements of modern medicine.

Thyroid therapy in cretinism

The best results are seen in cretinism. Here the skin soon becomes soft and moist, the bloating disappears, healthy growth of the bony structures, of the hair and of the soft tissues is stimulated, normal development of the teeth sets in and the mental condition improves, so that the patients change from apathetic semi-idiotic children to energetic and active individuals. The younger the subject, the better apparently the result, although all ages seem to react favorably. In a very small proportion of cases thyroid is without result, and one or two cases are recorded in which the disease was aggravated. The unsuccessful cases constitute not quite two per cent. of all those reported in the literature. As it is not excluded that in many of these instances the thyroid preparations employed were worthless, this is a remarkable showing and one that warrants the use of thyroid in all cases of myxedematous disease in children. Similarly good results are seen in operative myxedema; and in many instances the disagreeable phenomena following ablation of the thyroid gland could be prevented by the administration of thyroid preparations. In the endemic cretinism of adults the results are not quite so uniform, for in a certain proportion of the cases only the main symptoms are relieved while the minor and probably secondary manifestations persist; thus the edemas may promptly recede while the cachexia and the phenomena that are consecutive to the anemia in various organs remain uninfluenced by thyroid medication.

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*Portions of this chapter are quoted from my article on Organo-Therapy in "*The Reference Handbook of the Medical Sciences.*"

In operative myxedema

In endemic cretinism

Administration of thyroid

It is usually necessary to continue the administration of thyroid for some time; if the remedy has to be stopped temporarily, for reasons that will be presently discussed, then its use must be resumed again, from time to time, otherwise a recurrence of the symptoms is apt to supervene. This is due to the fact that the use of thyroid is merely a substitution therapy. In cases in which improvement is maintained for considerable periods after the administration of the remedy has been stopped, we must assume that the organism has stored away a certain reserve amount of the organ material. As soon as the latter becomes exhausted, symptoms of myxedema reappear and the recurrence of typical phenomena again calls for the administration of thyroid.

In the infantile form a course of thyroid carried on for a sufficient length of time, either continuously or intermittently, often leads to a permanent cure, so that the drug can ultimately be discontinued. This must be attributed to the fact that the substitution of thyroid, by relieving the defective thyroid of an amount of labor that it was unable to perform, has enabled it to develop up to the demands of the growing organism and ultimately to assume its normal function; such a favorable result, however, is exceedingly rare.

Distressing symptoms following thyroid medication

Thyroidism

Not infrequently, as indicated above, a congeries of distressing symptoms follows the prolonged use of thyroid that may call for an interruption of the treatment. The manifold effects that are attributed to thyroid feeding have been grouped under the name of thyroidism (or hyperthyroidism). They are characterized in extreme cases by pronounced tachycardia, palpitation, sweating, tremor and emaciation; the latter being due to increased intracellular oxidation and "accelerated" (?) metabolism, concerning chiefly the proteids and fats of the body, and manifesting itself by an increased excretion of nitrogen, phosphorus and chlorine. Fever and glycosuria are also occasionally observed. The patients develop an enormous appetite and thirst and often complain of headache, nausea, vomiting and weakness. It is doubtful whether these symptoms are due exclusively to the thyroid or whether they are due in part to certain toxic products contained in most thyroid preparations; for especially dried thyroid powder frequently contains ptomapeptones and peptotoxins that are highly poisonous even in minute quantities. This assumption is borne out by the fact that thyroidin (see below) rarely produces these symptoms, whereas dried extracts or the fresh (?) gland often produce them.

Arsenic in thyroidism

Fortunately, we are able in cases that develop symptoms of thyroidism to counteract most of these disagreeable effects by the administration of small doses of arsenic, e. g., three to five drops of Fowler's solution given during the day. The results of this arsenic treatment are really remarkable, and it is probably always a safe plan, if a prolonged thyroid treatment is contemplated, to give Fowler's solution in the above dose from the beginning.

Preparations of thyroid

Various preparations of the thyroid gland are employed. Bircher, in 1889, first implanted a piece of human thyroid gland under the skin and in this way produced a prolonged thyroid effect with a brilliant result. Grafting of sheep's thyroid has been tried in operative myxedema with good effect, but none of these methods is, of course, practical. Different extracts of thyroid have been prepared with glycerin alone, or with glycerin and carbolic acid and thymol; these are administered hypodermically. Another hypodermic preparation is made by extracting thyroid with carbolized physiological salt solution and sterilizing the extract by filtering it through clay filters under high pressure with carbonic acid gas (method of d'Arsonval). Many clinicians advise the use of the fresh gland, raw, by mouth (one-eighth to two sheep's thyroids a day). Good results are also claimed from the administration of the boiled organ, which is more palatable than raw thyroid. Finally, thyroid gland may be finely chopped and given in a clysma by rectum.

The most deservedly popular preparations, nowadays, however, are compressed thyroid tablets made from the dessicated gland. These are less disagreeable to administer than the other preparations mentioned and, if manufactured by a reliable house, enable the physician accurately to determine the dose. True, very little is known of the amount of active principle which they contain, but the same objection applies to all the other preparations. As it is essential to strictly individualize in thyroid medication, it is at all events of advantage to know that the qualitative and quantitative composition of the tablets is approximately uniform. As the fresh gland furnishes about 27 per cent. of dry powder, each unit of powder corresponds to about four times its equivalent in fresh gland. Manufacturers of thyroid tablets usually indicate the amount of thyroid powder contained in each tablet. The common average dose of the dessicated powder is from one to five grains three times a day.

The active principle of thyroid gland is iodothyrin* or thyroiodin (not thyroidin which is a name for the extract of the gland), a proteid body containing over 9 per cent. of iodine. It may be used in the place of the fresh thyroid extract but seems unable to replace it in all cases. The dose is from one-third to one-half grain (0.02-0.03 gm.) two or three times a day.

EXOPHTHALMIC GOITRE.

Thyroidism and exophthalmic goitre

Many of the symptoms of exophthalmic goitre (Graves's disease, Basedow's disease) resemble in their cardinal aspects the syndrome previously described (page 102) as thyroidism or hyperthyroidism, so that this disease is held to be due to excessive activity of the thyroid gland. As a matter of fact many of the symptoms of Graves's disease are attributable to an increased secretion of the thyroid gland. Other features can be explained by a qualitative perversion of the thyroid function. In addition, however, there are a variety of signs in this disorder that can only be explained by some functional derangement of the cervical sympathetic and its ganglia, an idea that is borne out histologically by the occasional discovery of lesions in this portion of the nervous system as well as in the central nervous organ, especially in the corpora restiformia.

The disorder of the thyroid in Graves's disease is not due to a *compensatory hypertrophy* of the gland caused by relatively excessive demands for thyroid secretion as in simple goitre (see page 109), but it is due to an absolute functional *hyperactivity* (and *disactivity*) with vascular engorgement which leads to the entrance into the blood stream of an excessive quantity of the internal secretion of the gland.

To supply thyroid extract in this disorder is, therefore, altogether irrational and paradoxical. It is unfortunate to record that this remedy is, nevertheless, extensively employed in this disease either empirically or from ignorance of the physiological action of thyroid extract. There can be no doubt that thyroid always does harm in this disease. There is no case on record of true Graves's disease in which thyroid medication was of benefit, and there are many cases on record in which it did serious harm.

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*It would be of no practical value to discuss in this place the many other so-called "active principles" that have been isolated as, e. g., thyreoglobulin, iodoglobulin, etc., etc.

Fallacy of using thyroid preparations in this disease

Of recent years, the serum and the milk of thyroidectomized animals has been utilized in the treatment of Graves's disease. The principle underlying this method is at least based on more sound physiological reasoning. The results obtained from the use of these preparations are for the present, however, ambiguous, and must be interpreted carefully and with great conservatism, especially as Graves's disease usually runs its course with many spontaneous remissions and intermissions. It is best, therefore, to suspend judgment for the present in regard to their efficacy.

Serum of thyroidectomized animals

Thymus has been used in Graves's disease with some good results. Again, however, spontaneous remissions and intermissions must be included in the calculation. As no one has ever reported any bad effects from the use of thymus, the preparations made from this gland may be tried in conjunction with other measures to be presently described. Raw thymus, from sheep, may be given, or thymus tablets. The dose of the latter should vary from five to fifteen grains two or three times a day.

Thymus

The most important general measure to be employed in the treatment of exophthalmic goitre is rest, both physical and psychical, for the disease is frequently characterized by emotional excitement or depression; therefore the patients should live under conditions and among people where they are safe from emotional excitement, worry, anger and nervous strain. In most cases it is well to take the patient away from home, friends and relations for a period of several weeks. A change of scene alone often works wonders.

Rest

If a case of Graves's disease is sent to a resort, a low altitude should be selected, for it is a common experience that elevations over two thousand feet frequently induce severe palpitation. Life at a high altitude, moreover, stimulates the nervous system, and in view of the hyper-excitability of the whole nervous apparatus in these cases, such stimulation should be avoided. The sea shore is never good for these cases, for life by the ocean is detrimental both on account of its stimulating effect upon the nerves and on account of the deleterious effect it exercises upon anemic patients in general.

Climate and altitude

Diet

There is much controversy in regard to the proper diet.

Many clinicians recommend a diet consisting largely of vegetables, cereals, fruit and milk, with the minimum of meat and eggs. Personally I have seen better results from an abundant meat and egg diet combined with the above. In Graves's disease the general metabolism is usually very active and many of these cases rapidly emaciate. The question has not definitely been decided by careful metabolic studies whether the disassimilation of the fats or of the proteids is particularly increased; at all events there is almost invariably a more active proteid metabolism than normal, as manifested by the increased excretion of nitrogen. Consequently, severe cases of Graves's disease should ingest more than the normal amount of albumen, otherwise they will attack the proteids of their own tissues in order to make up the deficit. Above all things in this as in any other disease the albumen of the body must be protected and this can only be done by supplying a sufficient quantity of albuminous pabulum by mouth. The patients, as a rule, feel better and stronger and retain their weight if abundant proteid is allowed. It is necessary, of course, to strictly individualize in this respect and to take into consideration the tastes of the patient, his previous habits, the state of the digestion and of the kidneys in each case. The objection that a ''meat toxemia'' develops on such a diet is theoretically constructed and not borne out by facts.

Electricity

Electricity should always be given a trial in Graves's disease, for considerable advantage accrues to some cases from its use. The galvanic current is preferably used, although general faradization is recommended by some clinicians, particularly of the French school. If the galvanic current is employed a small ball electrode, connected with the anode, should be applied below the angle of the jaw and slight pressure exercised upwards and inwards. The other electrode should be a flat sponge or plate applied to the back of the neck at the level of the lower cervical vertebra, that is, corresponding to the location of the lower cervical spinal ganglia. Often it is of advantage to change the direction of the current. The current in the beginning should not be stronger than one milliampere and should not be applied for more than three minutes at a time. Both sides of the neck should be galvanized at each sitting. Later, the strength of the current should be gradually increased to three or four milliamperes. At each sitting it should be slowly increased and then decreased. In this way not only the sympathetic, but also the various nerves of the neck that are in close proximity to it, especially the vagus and probably, to some extent, the upper portions of the spinal cord are reached by the electric current. Very often it will be found that this treatment properly carried out reduces the general nervousness of the patient as well as the palpitation and the tremor. Galvanization of the thyroid gland itself with a small sponge electrode is also often useful.

Hydrotherapy

Hydro-therapeutic means, unless they can be carried out under careful supervision in an institution, should be used guardedly. They have a place, however, in the treatment of Graves's disease. The exact choice of method will depend upon the presence or absence of severe degrees of anemia, of digestive disorders, of myocarditis or cardiac dilatation and upon the reactive state of the nervous system, notably the vaso-motors. At all events, severe hydriatic measures, i. e., extremes of heat or cold, should never be employed, but rather very mild, soothing measures. Most beneficial is immersion of the patient in water slightly below the body temperature, as described in the Chapter on *Heart Disease* (see page 26). Salt may be added or carbonated waters may be used (see page 25). The patient should lie perfectly still for five or ten minutes in the water, should then be rubbed dry with a rough towel, the surface of the body treated with alcohol and the patient immediately put to bed. In cases that are not very severe, the patients may be wrapped in a towel wrung out of lukewarm water, covered with woolen blankets and left in this packing for half an hour at a time. It is always best to leave the arms out of the packing, as otherwise a sense of restraint or uneasiness may be created that in these nervous and excitable individuals is decidedly detrimental. A Priessnitz compress (see page 51) over the thyroid applied two or three times a day for an hour or two at a time sometimes acts beneficially.

Medicamentous treatment

Iron
Arsenic
Bromides
Camphor
Hyoscine hydro-bromate
Valerian
Sulphate of soda
Aconite
Digitalis

The medicamentous treatment of Graves's disease is not very satisfactory. If there is much anemia iron and arsenic should be given, as described under *Anemia*. The nervous symptoms must be controlled with bromides, the best preparations being the bromide of soda and the bromide of strontium, both given in doses of from ten to thirty grains (0.65 to 2.0 gm.) preferably in milk, three or four times a day. Monobromate of camphor, in ten grain doses (0.65 gm.) may also be given several times a day. If there is much cerebral excitement, hyoscine hydrobromate, in doses of one-two-hundredth to one-one-hundredth grains, preferably combined with bromides or with valerian, is useful. Another remedy that seems to act beneficially in Graves's disease is phosphate of soda. It should be given in thirty to sixty grain doses (2 to 4 gm.) two or three times a day, in plenty of water. This drug seems to exercise its effect especially upon the nervous mechanism governing the heart. The best remedy for palpitation and tachycardia, however, is aconite. It should be given in intervals of from one to three hours and in doses of from one to three drops of the tincture until the desired effect is produced. Patients with Graves's disease may, to advantage, be kept on small doses of aconite for almost indefinite periods. Digitalis has no place in the treatment of this disease unless there is cardiac insufficiency. Even here great care must be exercised, for the constant over-action of the heart in this disorder frequently produces myocarditis and here digitalis, as has been shown on page 30, is a dangerous drug. While it is possible with digitalis to reduce the number of heart beats, it should never be used in this disease for this purpose alone, i. e., it should never be given in doses large enough to appreciably slow the heart.

Iodine

Iodine is another remedy that is commonly used in Graves's disease. Just why has never become quite clear to me, unless it be that there is a vague idea in the heads of some that iodine has something to do with the thyroid. Its employment is mentioned merely because this drug has been very popular in the treatment of exophthalmic goitre. Clinically, in my experience, iodine and iodides almost invariably do harm in this disease, and, as a rule, produce an exacerbation of all the symptoms.

Surgical treatment

Partial thyroidectomy

The surgical treatment of Graves's disease consists either in the extirpation of the gland, or of portions of the gland, ligation of the thyroid arteries or resection of the sympathetic or its ganglia. The results obtained from thyroidectomy in true exophthalmic goitre are only partially satisfactory even in the most expert hands. The operation has not infrequently been followed by very disagreeable consequences, notably about the heart, and occasionally death. The operation, however, may become necessary as an emergency measure if the thyroid enlargement is so considerable that dangerous symptoms of pressure upon the trachea, the esophagus or adjacent blood vessels or nerves occurs and the patient's life becomes endangered from this source.

Resection of the sympathetic

Resection of the sympathetic is an operation that theoretically is well founded. I have never had an opportunity to follow a case of Graves's disease before and after resection of the sympathetic or its ganglia in the neck. A critical review of the literature and of the various case reports fails to convince me that the operation is indicated, because equally good results seem to be obtainable with other means.. The operation is certainly not without danger, as a number of fatal cases have been reported, and if the patients survive the operation, disagreeable symptoms, especially about the psychic sphere, seem to develop and to persist for a long time. Judgment in regard to the advisability of this operation and of partial or complete thyroidectomy, as well as an expression of opinion in regard to the exact indications for surgical intervention, will have to be reserved until we know more about this subject.

SIMPLE GOITRE.

This disorder, especially simple parenchymatous hypertrophy of the thyroid, as frequently seen in juvenile individuals, often yields to thyroid medication. If, however, degenerative changes are present in the parenchyma of the gland, if the enlargement of the thyroid is due to vascular disturbances, as in Graves's disease (see page 104), or if it is due to hyperplasia of the intestinal tissues, or to tumor formation, then thyroid treatment rarely exercises any beneficial effects.

Rationale for the use of thyroid

In the hypertrophic variety of thyroid swelling in adolescents we must assume that the thyroid is endeavoring to meet the increasing demands of the growing organism by compensatory over-activity. By supplying thyroid we relieve the gland of some of this excessive labor, and in this way spare the organ, prevent permanent functional inadequacy or degenerative changes, and thus enable it to regain its normal function and size. In this form very remarkable results are occasionally observed from the temporary administration even of small doses of thyroid or of iodothyrin. The largest statistics on the subject have been gathered by H. G. Wells, who reported 584 cases of struma simplex treated with thyroid extract, of which 62 per cent. were improved. The best results are obtained in recent cases, so that the treatment should be instituted as early as possible. The remedy must be continued in small doses (see page 103) for a long time, either uninterruptedly or with short intermissions, otherwise recurrences are apt to appear. Here, again, the stimultaneous administration of Fowler's solution in small doses is of signal benefit in preventing the disagreeable symptoms of thyroidism.

Thymus

It is interesting to note that very good results are also occasionally observed in simple goitre from the administration of thymus preparations, preferably given in tablet form, in gradually increasing doses (see page 105).

The indications for the use of other remedies than thyroid and thymus, and for dietetic, hydro-therapeutic and electric means of treatment, do not differ materially from those described under *Exophthalmic Goitre.*

In extreme cases that do not yield to medical means removal of the gland, or a portion of the thyroid, often remains the only resource.

II. ADDISON'S DISEASE.

The treatment of Addison's disease, owing to our uncertain knowledge of its pathology, is in a very unsatisfactory state. No case of Addison's disease has ever been cured. The patient's strength must be supported during the attacks of weakness that so commonly supervene in this affection, preferably by rest in bed and the use of a nourishing diet containing an abundance of proteid foods. General tonics, notably strychnia and arsenic, may be administered.

The anemia should be treated like any other anemia. The gastro-intestinal symptoms should be treated as described under *Diseases of the Stomach and Intestine.* Particular care should be taken in this disease to refrain from the administration of strong purges, as otherwise very intractible diarrheas may be induced. Hydro-therapeutic measures, electricity and transfusion have repeatedly been tried without any determinable effect.

Organo-therapy
The use of supra renals

The use of fresh suprarenal glands and of suprarenal extract is always indicated for, in the majority of causes of Addison's disease, marked organic changes, frequently obliteration, of the suprarenal glands have been discovered. The use of suprarenal preparations has, however, never cured a case. In many instances marked improvement followed the administration of this remedy; in an equally large proportion of cases, however, one must confess that no appreciable effect could be discovered from its use. In those in which the preparation seemed to relieve, withdrawal of the remedy was almost invariably followed by an aggravation of the symptoms; which demonstrates that the suprarenal treatment has some virtue. Here and there in the literature is found a case report in which the condition of the patient seems to have been rendered worse by the use of suprarenal preparations, but this fact should not militate against their use in view of the utter inadequacy of all other remedial measures. It is difficult, moreover, to conservatively interpret either amelioration or aggravation from the use of any remedy in Addison's disease, owing to the spontaneous fluctuations in the condition of the patient that are so characteristic of this disorder. When one considers that there are hardly one hundred well authenticated cases of Addison's disease recorded in the literature; that many of them were not studied with accuracy; that most of them came under observation at a very late stage; that finally some of the suprarenal preparations employed were inert; then the conclusion becomes unavoidable that the question of suprarenal therapy in this disease can in no sense be considered settled.

When one considers further that the active principles contained in the suprarenal gland undergo very radical changes in the digestive tract within a short time; that the percentage of hypothetical active principles varies greatly in the different glands; then some of these indifferent results may also be understood.

The remedy should, at all events, be given a thorough trial. The earlier the disease comes under observation the more apt is one to obtain some therapeutic results, at least symptomatically. The best preparation to use is the powdered extract. The dose cannot be specified; too much can, however, hardly be given, as no untoward effects, excepting some irritative phenomena about the stomach or intestine, are ever observed from the administration of these preparations by mouth. Some authorities claim to have obtained better results from the use of fresh gland, given in doses of two or three glands (from sheep) a day. Adrenalin has been used, but the results seen from this remedy are no better, probably less favorable, than those obtained from the use of the dry extract or the fresh glands.

CHAPTER IV.

DISEASES OF METABOLISM

INTRODUCTION—THE LAWS OF NUTRITION.

Introductory
The laws of nutrition.

That we may understand the pathology of a disease, and that we may intelligently treat it, it is necessary to understand the function or functions a perversion of which it represents. In the case of the diseases to be discussed in this chapter it is therefore essential to appreciate the fundamental principles that underlie metabolism before attempting to treat its disorders. The manifold facts that constitute the sum total of our knowledge of this subject cannot be discussed in full within the comparatively narrow limits of this book.* I will content myself, therefore, with describing those elements merely that have a direct practical bearing upon treatment.

Composition of the food

The food of man consists of organic and inorganic constituents. The former comprise water and a number of inorganic salts; the latter a variety of bodies containing carbon, oxygen, hydrogen, nitrogen and some phosphorus and sulphur, and classified as proteids, carbohydrates and fats. The rôle of the inorganic and organic food elements differs; for, whereas the inorganic constituents pass through the body unchanged, the organic constituents undergo a number of fermentative and oxidative metamorphoses so that they leave the body in the form of highly oxidized, inert, terminal products of which urea, water and carbon dioxide are the main representatives.

Inorganic and organic food elements

Terminal products

In this process of oxidative destruction, which can be crudely likened to a combustion, and the finer intermediary mechanism of which need not be discussed in this place, a certain amount of energy is developed by each organic article of food. To measure this amount of energy or its mechanical equivalent in heat or labor, the term calorie has been imported from the realm of physics; a calorie being the amount of heat required to raise the temperature of one kilo** of water one degree Celsius.

The development of energy

Definition of a calorie

Caloric value of proteids, carbohydrates fats

It has been determined that each of the three food classes in process of metabolism (i. e., of assimilation, splitting and oxidation) generates a definite number of calories, viz.,

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*For details I refer to my forthcoming book on "*Diseases of Metabolism.*"

(1) **1 Kilo (kilogramme)=2 lb. 3 oz. 2 dr. (avoirdupois).
1 gramme=15½ grains (15.432349 grs.).

1 gramme* of proteid furnishes	4.1 calories.
1 gramme of carbohydrate furnishes	4.1 calories.
1 gramme of fat furnishes	9.3 calories.

Daily caloric requirement

Law of isodynamics

It has further been determined that a normal adult requires from 30 to 35 calories per kilo of body weight a day in order to maintain nutritive equilibrium; i. e., assuming an average weight of 70 kilo, 70×30—35, or from 2100—2450 calories per diem. Theoretically this caloric requirement can be supplied vicariously by proteids, fats or carbohydrates; actually, however, this "law of isodynamics" is not valid; for the peculiarities of our digestive and assimilative functions, as well as the character of our intracellular metabolism, render it impossible for an individual to subsist on one food class alone.

Proteid minimum

Average adult requirement expressed in grammes per kilo

Above all a certain amount of proteid is essential. The absolute minimum lies somewhere between 40 and 80 grammes for the twenty-four hours' period. The average amount ingested is, however, much larger; the daily quantity of food containing from 90 to 115 gm. of albumen (370 to 420 calories), 50 to 60 gms. of fat (465 to 560 calories), and 400 to 450 gms. of carbohydrate (1640 to 1850 calories) representing in round numbers a total of from 2500 to 2900 calories. The same expressed in grammes per kilo of body-weight signifies that a normal average adult requires about 1.5 gm. of albumen, 0.8 gm. of fat and 7.1 gm. of carbohydrate per diem per kilo. The amount of rest and exercise, and the sex (women requiring less total calories than men) and many other factors influence these figures somewhat.

Caloric value of different articles of food

In order to perform dietetic calculations that, as will presently be shown, are of great importance in the proper feeding of sufferers from metabolic disorders, it is necessary to know the caloric value of the different articles of food; to do this the percentage of albumen, carbohydrate and fat each article contains must be known. The caloric value can then readily be determined by multiplying the grammes of albumen by 4.1, of carbohydrate by 4.1, and of fat by 9.3. The following table gives the approximate albumen, carbohydrate and fat content of the most important common foods.

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(2) *These figures hold good only for pure albumen, carbohydrates and fat. The actual amount of caloric value that is placed at the disposal of the organism by different foods depends, however, largely upon the physical properties of these foods, the amount lost in the feces; i. e., their digestibility, assimilability, and a variety of other factors peculiar to each individual, so that actually these figures must be modified to read:

1 gramme of proteid furnishes 3.2 calories.
1 gramme of carbohydrate furnishes 3.8 calories.
1 gramme of fat furnishes 8.4 calories.

TABLE I.

TABLE GIVING PERCENTAGE OF ALBUMEN, FAT AND CARBOHYDRATE IN COMMON ARTICLES OF DIET.

Animal Foods.

KIND OF FOOD.	Albumen %.	Fat %.	Carbohydrate %.
Veal, lean, raw	20.0	1.5	.....
Veal, fat, raw	19.0	7.5	.....
Beef, medium, raw	20.5	1.5	.....
Beef, fat, raw	21.0	5.5	.....
Beef, boiled	38.0	9.15	.....
Beef, roasted	32.0	8.0	.....
Meat broth	10.4	0.6	.....
Mutton, medium, fat, raw	17.0	6.0	.....
Pork, raw, fat	14.5	37.5	.....
Pork, raw, lean	20.0	7.0	....
Ham, lean, cured	24.0	8.0	.....
Chicken	21.0	2.0	2.0
Duck	22.0	3.0	2.0
Goose	16.0	45.1	.....
Pigeon	22.0	1.0	0.76
Codfish	82.0	0.5	.....
Salmon (fresh)	21.0	12.5	.....
Trout	19.0	2.0	.....
Caviar	32.0	15.5	2.0
Oysters	8.0	1.5	2.6
Kidney	18.0	5.0	0.15
Liver	19.5	4.5	3.28
Tongue (boiled)	15.0	17.5	0.5
Tongue (smoked)	24.5	31.5	.....
Bacon	9.5	76.0	.....
Suet	0.5	98.0	.....
Lard	0.5	99.0	.....
Frankfurter sausage	12.0	40.0	2.25
Egg (with shell)	12.5	12.6	0.5
White of egg	12.7	0.25	0.7
Yolk of egg	16.0	32.0	0.1
Milk	3.5	4.0	4.9
Milk, skimmed	3.1	0.7	4.8
Buttermilk	4.0	0.9	3.7
Cream	3.6	25.0	3.5
Butter	0.7	84.0	0.6
Cheese (Swiss, American)	34.0	11.0	3.5
Neufchatel cheese	19.0	41.0	1.0
Camembert cheese	25.0	30.5	1.5

Vegetable Foods.

KIND OF FOOD.	Albumen %.	Fat %.	Carbohydrate %.
Wheat flour	10.0	1.0	72.0
Oatmeal	13.5	6.0	67.0
Wheat bread	7.0	0.5	52.0
Rye bread	6.0	0.5	47.0

	Albumen %.	Fat %.	Carbohydrate %.
Zwieback	13.0	3.0	80.0
Macaroni and noodles	9.0	0.5	77.0
Rice	9.0	1.0	78.5
Potato	2.0	0.2	20.5
Carrots	1.0	0.2	8.0
Peas (green)	6.0	0.5	11.0
Cabbage	2.5	0.5	6.5
Cauliflower	2.5	0.3	4.5
Sauerkraut	1.0	0.2	4.5
Spinach	3.0	0.5	5.0
Asparagus	2.5	0.4	2.5
Dried peas	23.0	2.0	52.5
Beans	24.5	2.0	52.0
Radishes	1.2	0.1	3.7
Lettuce	1.4	0.3	2.2
Cucumber	1.0	0.09	2.2
Sugar	0.5	.....	96.5
Olive oil	....	95.0	.....
Fresh fruit	0.5	.....	10.0
Mushrooms	2.5	0.1	4.8

Beverages.

	Alcohol %.*	Albumen %.	Fat %.	Carbohydrate %.
Beer	4.0	4.3	....	0.8
White wine	....	....	....	1.6
Claret	10.0	0.2	....	11.0
Madeira	20.0	0.2	....	3.0
Port	18.0	0.18	....	5.8
Sherry	17.0	0.2	....	5.0
Champagne	11.0	0.2	....	12.0
Brandy	70.0	....	....	....
Coffee	....	0.16	0.5	1.4
Tea	....	0.16	0.5	1.4
Cocoa	....	14.0	47.0	18.5
Chocolate	....	5.0	15.0	75.0

This table is used as follows to calculate the caloric value of the diet that an individual is eating or to arrange a dietary in such a way that it will incorporate any desired quantity of calories. Assuming for instance that the individual is eating in the twenty-four hours the following articles of food, then the amount of albumen, fat and carbohydrate they contain can readily be gathered from the table as follows:

Articles.	Albumen.	Fat.	Carbohydrate.
50 gm. of roast beef	16.0	4.0	....
100 gm. of chicken	21.0	2.0	2.0
10 gm. of butter	....	8.4	....
20 gm. of potatoes	4.0	0.4	41.0
100 gm. of oatmeal	13.5	6.0	67.0
200 cc. of milk	7.0	8.0	10.0

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*One gramme of alcohol has a caloric value of 7 (see page 138).

50 gm. of lettuce.......	0.6	0.2	1.7	
100 gm. of cauliflower..	2.5	0.3	4.5	
200 gm. of white bread.	14.0	1.0	104.0	
2 eggs at 50 gm........	25.0	24.0	1.0	
100 gm. of rye bread....	6.0	0.5	47.0	
100 gm. of fresh fruit..	2.5	1.0	55.0	
50 gm. of sugar.......	0.1	.....	48.0	
50 cc. of madeira..........	....	.....	1.5	(20% alcohol)
Total	112.4	55.8	402.7	

The individual, then, is receiving 112.4 gm. of albumen, 55.8 gm. of fat, 402.7 gm. of carbohydrates, and 10 gm. of alcohol. Expressed in calories:

Albumen,	114.4×4.1= 460.84 cal.
Fats,	55.8×9.3= 518.94 cal.
Carbohydrates,	402.7×4.1=1651.07 cal.
Alcohol,	10.0×7. = 70.00 cal.
Total,	2700.85 Cal.

On a mixed diet of this character the individual, therefore, is ingesting food of a total caloric value sufficient to more than adequately maintain nutrition; for, assuming the subject to weigh as much as 70 kilo, he would be receiving 2700÷70=38.5 calories per kilo, distributed as follows:

1.6 gm. of albumen
0.8 gm. of fat
5.74 gm. of carbohydrate

per kilo of body weight. This, as shown above, would approximate very closely normal requirements.

The group of metabolic diseases

Among the diseases of metabolism are included diabetes, obesity, gout and the uric acid diathesis, osteomalacia, rachitis and, in a special sense, chronic rheumatism. In many other diseases perversions of metabolism occur, but there the metabolic derangement is merely one more or less unimportant and, at all events, secondary symptom of definite and known underlying causes. In the diseases of metabolism proper the metabolic derangement is the primary event and the determining factor in the production of the disease.

Interrelationship of all metabolic diseases

All the diseases of this group, especially diabetes, obesity and the uric acid diathesis, are intimately related to one another pathogenetically, chemically and clinically. In one the perversion of the carbohydrate metabolism, in the other of the fat metabolism, in the third, of the proteid (nuclein) metabolism predominates, and each is characterized by an inability on the part of the organism to destroy sugar or fat or albumen (nucleins) in a normal manner. In this way sugar, fat or nucleins and their congeners accumulate and the pictures of diabetes, obesity and gout are created. The metabolism of the proteids, fats and carbohydrates is, however, so intimately concatenated that, as a rule, we witness combinations of diabetes and obesity, of diabetes and gout, of gout and obesity, or of all three together.

Inadequacy of causal treatment.

General therapeutic indications.

Causal treatment, in view of our ignorance for the present of the etiology of the diseases of metabolism, and also in view of the intangible hereditary element that is so important a factor in all functional weakness or perversion of the protoplasm at large, is not satisfactory, so that the main therapeutic indication is by dietetic means to compensate the defective intracellular nutrition, and, at the same time to maintain adequate general nutrition. This, as will presently be shown, can be done only by employing accurate methods. General hygienic and, above all, medicamentous means of treatment in this class of disorders play a relatively subordinate part.

I. DIABETES MELLITUS.

The most important element in the treatment of diabetes is the regulation of the diet. The main objects to be accomplished are to maintain the general nutrition of the patient, to increase his tolerance for carbohydrates and, by implication, to reduce or prevent the loss of sugar in the urine.

Loss of calories in urinary sugar.

I have explained in the preceding section how the caloric value of the food can be determined and what amount of calories a normal individual requires in order to maintain adequate nutrition.

In case of diabetes with the loss of valuable unconsumed sugar in the urine, a diet that would adequately feed a normal individual does not furnish the body with a sufficient caloric value, and as a result the patient, once the deficit is not supplied, consumes his own tissues and emaciates. Here, therefore, whenever possible, a metabolic study should be undertaken in order to determine this deficit. Whenever this can be done it is of inestimable value, provided the figures obtained are interpreted with conservatism.

With the introduction of calorimetric methods, however, into the treatment of diabetes the danger of substituting an ultrascientific routine for the old-fashioned and venerable, though
gether unscientific, routine of feeding every diabetic on a
containing no starches or sugars, has been created. For
clinician the proper treatment of the case has only begun
the metabolic study is completed; as, to him, individual pe-
es and divers complicating factors that determine devia-

Difficulties of carrying out metabolic calculations

tions from the metabolic schedule must be included in the calculation. It is well to realize, moreover, that the general practitioner cannot perform these metabolic studies in each case of diabetes that comes under observation. He has neither the time nor the facilities, nor possibly the training, nor, above all, in most cases the co-operation of the patient to do this work; for to properly carry out a metabolic study the patient should be under absolute and rigid control for several successive days, or better, weeks, preferably in a hospital. Nevertheless before discussing the practical methods that can be employed, and that have evolved from an immense number of accurate studies, the principles that underlie such a metabolic calculation may be briefly described, for they should be familiar to every physician. The following case report (quoted from the author's "Clinical Urinology," page 73) may serve as an illustrating prototype of a metabolic study in a case of diabetes:

Example of a metabolic calculation in diabetes

Mrs. W. P. Weight 60[*] kilo. Calories required for adequate nutrition, 60×35=2100.

Average diet on six successive days:

Proteids ....150 150 gm.×4.1= 615.0 cal.
Carbohydrates ....190 gm.×4.1= 779.0 cal.
Fats ....110 gm.×9.3=1023.0 cal.

Total caloric intake=2417.0 cal.

The patient's daily average sugar excretion on four successive days on this diet was 160 gm. This amount calculated in calories must, therefore, be deducted as follows:

Average daily sugar excretion......160 gm.×4.1= 656.0 cal.

Calories utilized=1761. cal.

Instead of receiving, therefore, the full caloric value required, i. e., 2100 cal., the patient, owing to the loss of sugar, only utilized 1761 cal., although the diet represented 2417 cal. This means a deficit of 2100—1761=339 cal. And these deficient calories unless furnished in additional food must be supplied from the destruction of the patient's proper tissues.

One can further readily calculate what proportion of this deficit was made good from the albumin of the patient's tissues.

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[*] The figures are given in round numbers throughout in order to facilitate the calculation.

what from the fat (for the patient lost weight on this diet), and the diet can be regulated accordingly. All one has to do is to determine the nitrogen output in the urine and feces, and compare it with the nitrogen intake (food nitrogen).

This patient, for instance, received in the daily diet 150 gm. of albumin, and as albumin contains 16 per cent. of nitrogen, this amount contained 24.0 gm. of nitrogen. On this diet the patient excreted a daily average of 23.7 gm. of N. in the urine, and 3.01 gm. of N. in the feces, making the total N. output $23.7+3.1=26.8$ gm. of N. The nitrogen output, therefore, was greater by 2.8 gm. ($26.8-24=2.8$) than the N. intake, and this excess must have been derived from the patient's own albumin. These 2.8 gm. of N. are contained in 17.5 gm. of albumin ($2.8\times100\div16=17.5$).

As 17.5 gm. of albumin can produce only 71.75 calories ($17.5\times4.1=71.75$), there still remain 268.25 ($339-71.75=268.25$) of the 339 deficient calories to be accounted for. As these must have been derived from the patient's fat, one can readily determine by dividing 268.25 by 9.3 (the caloric value of one gramme of fat) that $268.25\div9.3=28.8$ gm. of the patient's fat were consumed.

The patient, therefore, on a diet valued at 2417 calories, i. e., considerably more than the calculated value necessary to adequately nourish a normal subject of 60 kilo (2100 cal.), lost 17.5 gm. of her own albumin and 28.8 gm. of her own fat.

Vicarious feeding

If it were true that a diabetic could use none of the sugar that enters the blood stream, the question of feeding such a case would be theoretically a very simple one. One would have to exclude the carbohydrates and replace them by proteids and fats of sufficient caloric value to make up the caloric deficit. In the case which is quoted, for instance, the patient would have to receive 17.5 gm. of albumin and 28.8 gm. of fat, in addition to the proteids, fats and carbohydrates enumerated in the above diet.

Necessity of supplying some carbohydrate

As a matter of fact only a small minority of cases of diabetes are altogether unable to utilize any of the sugar. These are very grave instances that are fortunately rare, and would be still less frequent if many milder cases were not transformed into grave ones by injudicious dieting. The great majority of patients can utilize some of the sugar and it is generally bad practice to withhold this food permanently; for aside from the glycosuria, the digestive function, the comfort of the patient, and above all the formation of acetone bodies (see below) must be considered.

The boundary of tolerance, or assimilation

In order to know how much sugar these patients can safely take without over-taxing their sugar metabolism, it is, however, necessary to determine, as a preliminary step, the tolerance of each case for carbohydrates, or the so-called boundary of assimilation, and to feed the patients accordingly.

Diabetic test meal

In order to do this the patient is given what may be called a diabetic test meal. This consists of a series of articles that are free from carbohydrates, plus a weighed portion of some carbohydrate food. The following table incorporates the most important carbohydrate free articles of food that can be used to arrange such a test meal. I give this diet list in this place in full, because, as will be presently shown, the articles included therein must often be utilized to the exclusion of everything else in the treatment of diabetes (see Table II).

TABLE II.*

ARTICLES OF FOOD PRACTICALLY FREE FROM CARBOHYDRATES.

Fresh Meats.—All the muscular tissues of mammals and birds, braised, boiled or roasted with their own gravy, with butter, with meal or flour: fresh mayonnaise or other sauces made without flour—warm or cold.

Inner Parts of Animals.—Tongue, heart, lungs, brain, calf's spleen, kidney, marrow. Liver of calf, game and poultry up to 100 grammes (weighed after cooking).

External Parts of Animals.—Feet, ears, snout and tail of all edible animals.

Conserved Meats.—Dried and smoked meats, smoked and salted tongue, pickled meats, ham, bacon, tinned meats.

Sausage.—All varieties, if free from bread or flour.

Fresh Fish.—All fresh and salt water fish, boiled or grilled or served with flour-free sauce. Fresh melted or browned butter may be taken at the same time. If the fish is cooked in bread crumbs, the latter should be removed before eating.

Conserved Fish.—Dried, salted, or smoked fish, such as cod, shell fish, herring, mackerel, sole, plaice, salmon, sprats, eels, etc.; also pickled herrings, sardines in oil, mackerel in oil, anchovies, sardellen, tunny. Caviar.

Mussels and Crustacea.—Oysters, mussels, lobster, crab.

Eggs.—From all birds, raw or cooked in various ways, but without added flour or meal.

Fats.—Of animals or vegetable origin, *e. g.*, butter, lard, fat of roast meats, margarine, olive oil, usual salad oil, cocoa butter, goose fat. Cod liver oil.

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*Quoted in part from von Noorden. "*Diabetes.*"

Cream.—Good fat, rich cream, sweet or sour, as drink or added to solid foods or to drinks up to about 200 cc. a day. For cooking purposes cream may be substituted for flour when making special dishes of meat, fish, vegetables and eggs.

Fresh Vegetables.—Salads; lettuce, endives, cress, dandelion, purslane.

Aromatic Herbs.—Parsley, dill, thyme, pimpernell, mint, leek, garlic, celery.

Fruits, Roots and Stalks.—Gherkin, tomato, young green beans, vegetable marrow, onions, radishes, white and green asparagus, hops, Brussels sprouts, celery (except the root), young rhubarb sprouts.

Blossoms and Flowers—Cauliflower, Brussels sprouts, artichoke.

Leaves.—Spinach, sorrel, cabbage, red beet.

Fungi.—Fresh mushrooms, truffles in usual quantities.

Fruits.—Bilberries, unripe gooseberries, when prepared with saccharin instead of sugar.

Conserved Vegetables.—Asparagus, haricot beans, cut beans, salted gherkins, pickled gherkins, peppered gherkins, mixed pickles, sauerkraut, olives, champignons and any prepared vegetables of those groups already mentioned.

Condiments.—Salt, white and black pepper, cayenne, paprika, curry, cinnamon, clove, nutmeg, English mustard, saffron, caraway, caper, vinegar, citron.

Soups.—Meat soups prepared from fresh meats or meat extracts, with the addition of green vegetables, asparagus, eggs, fragments of meat, marrow, liver, Parmesan cheese or other foods *contained in this table.*

Sweets.—Prepared from eggs, cream, almonds, citron, gelatine, saccharine being substituted for sugar.

Drinks.—All varieties of spring and seltzer water. Good brands of brandy, rum, arack, whisky, and other fruit spirits.

Wine.—All the well-known table wines (white and red) are almost sugar free—at all events those that have been kept for three or more years in casks. Bordeaux and Burgundy wines come under this category. White Rhine and Moselle wines are also free from carbohydrates.

Tea, Coffee and Cocoa.—With cream, but with saccharine substituted for sugar.

Lemonade.—Seltzer water with lemon juice, sweetened with saccharin or glycerin (lævulose may be used especially if permitted).

A very convenient diabetic test meal can be selected from the above articles. The following one I use almost as a routine in these determinations:

TYPE OF DIABETIC TEST MEAL.

For Breakfast—

Two soft boiled eggs.
150 cc. of weak tea with a tablespoonful of cream.
A beefsteak, weighing (cooked) 100 grammes.

For Dinner—

Bouillon with one egg.
Boiled or fried fish and broiled chicken, the two together weighing (cooked) not more than 250 grammes.
A little celery.
Boiled onions.
Cauliflower.
Lettuce salad with plenty of oil dressing.
A cup of weak tea or coffee with a tablespoonful of cream.
About 30 grammes of Neufchatel or Camembert cheese.

For Supper—

Two boiled eggs.
Cold asparagus, or tomatoes, or lettuce salad with plenty of oil dressing.
A little bacon.
A cup of weak tea with two tablespoonfuls of cream.

Method of determining boundary of tolerance

If a patient is placed upon this diet for forty-eight hours, and if at the end of that time the urine is sugar free, then one is dealing with a mild form of diabetes and it now becomes necessary to determine how much carbohydrate food the patient can tolerate without excreting sugar. This is done by adding white bread to the above test meal, beginning preferably with 100 grammes during the first day, distributed over two meals in 50 gramme quantities, and increasing this bread ration each day by 50 grammes until sugar appears in the urine. Thus, if a patient on one day excretes no sugar after eating $3 \times 50 = 150$ gm. of bread, and on the next day passes sugar on $4 \times 50 = 200$ gm. of bread, then we say that the boundary of assimilation lies between 150 and 200 gm. of white bread. The diagnostic and therapeutic importance of knowing this boundary of assimilation, or the tolerance for carbohydrates, will presently be discussed.

The three degrees of diabetes

For practical therapeutic purposes it is convenient to distinguish three degrees of diabetes that may be determined as follows:

The first degree, mild diabetes

In the first category, the mildest forms of diabetes, the sugar should disappear within two days after complete withdrawal of carbohydrate foods, i. e., as soon as the patient is placed upon the carbohydrate-free test meal mentioned above. To the category of mild cases also still belong those instances in which the patients fail to excrete sugar when there are added to this carbohydrate-free diet from 100 to 150 grammes of white bread.

Two categories of mild diabetes

From a clinical standpoint it is important to distinguish among these mild cases of diabetes two groups, viz., those form that occur in persons past middle age or old individuals and those that occur in very young people. The prognosis in the former class of cases is always better than in the latter. Individuals of the first type are usually moderately obese and commonly show some evidences of the uratic diathesis. In the young cases the neurotic type predominates, and unless great care is exercised in these individuals, they are apt to develop into the medium or the severe type of diabetes.

The second degree, diabetes of medium severity

To the second category of cases, diabetes of medium severity, belong those instances in which complete withdrawal of carbohydrates is necessary for at least two or three weeks before the sugar completely disappears from the urine. Among these cases of medium severity several groups must be distinguished for practical reasons.

Three groups diabetes of medium severity

There is one group of cases in which the withdrawal of carbohydrates not only causes the disappearance of sugar within two or three weeks, but also produces much general improvement in the condition of the patient, an increase of weight and a disappearance of acetone bodies from the urine (disappearance of Gerhardt's ferric chloride reaction).

In a second group of cases, the withdrawal of carbohydrates again leads to the disappearance of sugar from the urine, but in the beginning there is considerable loss of weight, the patients feel weak and Gerhardt's reaction either appears for the first time or increases in intensity. Within a few days, however, after the disappearance of the sugar a change for the better occurs, the weight again increases, the patients recover their sense of well-being and the Gerhardt reaction disappears.

In a third group of cases, finally, the condition becomes aggravated at once, and while the sugar may disappear the patients rapidly begin to lose weight and complain of great weakness; it the same time the Gerhardt reaction appears and rapidly increases in intensity. In addition, such patients commonly develop digestive disorders and diarrhea. This last group of cases forms the transition to the third or severe type of diabetes and should be treated accordingly.

The third degree, severe diabetes

In the third category, the severe type of diabetes, finally, the sugar does not disappear, even if the patients are placed for weeks or months upon a carbohydrate-free diet, showing that these individuals are unable to consume even that proportion of sugar which is generated within their own tissues from the disintegration of their own albumens. Here the sugar does not disappear from the urine until the food albumens are considerably reduced, indicating conclusively that the albumens may be a very prolific source of sugar, a fact of great practical importance and one that is often overlooked (see page 128). In the most severe type of diabetes, finally, it is altogether impossible to cause the disappearance of the urinary sugar, even when the patients are starved, i. e., when all food is withdrawn.

General considerations relative to prognosis and treatment of the three degrees of diabetes

The prognosis and the treatment of these three classes of diabetes varies radically and each type must be discussed separately. In the light cases, and in the cases of medium severity, the main object of treatment must be to cause the disappearance of the sugar from the urine; for in this way the tolerance for carbohydrates can ultimately, as a rule, be increased and complications removed; whereas if the glycosuria, thanks to careless dieting, is allowed to persist, the cases almost invariably become aggravated. The complete withdrawal of carbohydrates is, however, rarely necessary as a permanent procedure, as will be presently shown. In the severe cases less attention should be paid to the glycosuria and more to maintaining the general nutrition of the diabetic patient.

DIETETICS OF THE LIGHT FORM OF DIABETES.

"Resting" and "exercising" the sugar metabolism

In this class the principle of sparing those organs that are concerned with the metabolism of sugars must be enforced and here the plan can be adopted of first "resting" the sugar metabolism, so to say, for short periods of time by the complete withdrawal of carbohydrate food from the diet, and then gradually adding carbohydrate foods to the diet to "exercise" the sugar-destroying functions back to normal. It is hardly necessary in most cases to keep such patients for long on a carbohydrate-free diet.

Technique

They should be placed at first upon a diet containing no carbohydrate foods (see Table II). During this period great care should, however, be exercised to furnish enough calories to adequately nourish the patient. This can usually be accom-

[illegible] Should the patient begin to lose flesh upon the restricted regime, despite the ingestion of [illegible], or should very large quantities of acetone and [illegible] diacetic acid and ammonia appear in the urine, then the restricted diet is to be abandoned and some carbohydrate must be administered. Even if no untoward symptoms appear, however, it is generally better after four to six weeks of restricted diet to allow the patients some carbohydrate food for the sake of their appetite and general condition. It is much easier to manage these cases and also to [illegible] slightly [illegible] in the food, if some bread, potatoes, rice or other starchy food is allowed.

Before the addition of carbohydrates to the diet in such cases the boundary of tolerance should be very carefully determined, as described above (see page [illegible]). They should now be kept for a time upon a regime containing an amount of white bread that corresponds to an amount that is somewhat below the established boundary of tolerance.

Should sugar reappear again, then the amount of carbohydrate food should at once be reduced or stopped altogether until the urine becomes sugar-free again. If the patient bears the addition of white bread well for several weeks and if no glycosuria supervenes, then he may safely be kept on this amount of white bread, or its equivalent (see Table III), for many weeks or months at a time. From time to time a period of restricted diet should again be instituted and the boundary of tolerance redetermined.

Equivalents of white bread

The following table indicates various articles of food containing an amount of carbohydrate that corresponds to that contained in 100 gm. of white bread.

TABLE III.

THE CARBOHYDRATE CONTAINED IN 100 GM. OF WHITE BREAD IS EQUIVALENT TO THE CARBOHYDRATE IN:

2 litres of milk or buttermilk.

120 gm. of rye or graham bread.

200 gm. of aleuronat or gluten bread.*

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*DIABETIC BREADS.—Most so-called diabetic breads contain approximately [illegible] per cent of carbohydrate. The vegetable albumens (aleuronat, roborat, plasmon, gluten) all contain about 5 per cent of carbohydrate. These breads are made from such flours plus a certain amount (one to four parts) of ordinary flour. They should only be used as equivalents for white bread in the proportion of about 2 to 1. Their indiscriminate use, which is so popular with the laity who imagine that these breads can be safely taken *ad libitum*, is therefore to be condemned as dangerous. They fulfill a useful purpose, however, owing to the fact that twice as much of the various diabetic breads can be eaten as of ordinary white or rye bread and still no greater amount of

70 gm. of zwieback.
100 gm. of chocolate.
80 gm. of chestnuts (peeled).
80 gm. of flour (wheat, rye, barley, buckwheat).
70 gm. of rice.
70 gm. of noodles or macaroni.
70 gm. of oatmeal.
120 gm. of dried peas, beans, lentils.
200 gm. of green peas.
360 gm. of new potatoes.
280 gm. of old potatoes.
240 gm. of fresh apples, pears, plums, apricots, cherries, grapes.
400 gm. of strawberries, raspberries, gooseberries, blackberries, cranberries, huckleberries.
100 gm. of figs.
6 bananas.
6 peaches.
Two handfuls of walnuts, hazelnuts, almonds.
1-3 litre of Port, Sherry or Madeira.
1 1-3 litres of beer.

It is clear that such large quantities of any one of these articles should rarely be eaten in place of bread. I have given these equivalents for one hundred grammes of white bread chiefly for the sake of convenience in calculation.

The different articles of food

Milk, bread, potatoes, cereals, diabetic breads, a little beer and the other articles enumerated above may be allowed sparingly, provided their carbohydrate content is included carefully in the calculation in such a way that for each gramme of these articles that is permitted a corresponding amount of white bread is withdrawn.

In this way one should succeed in keeping these patients permanently sugar-free and not infrequently in practically

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carbohydrate be administered. This is an advantage inasmuch as the bulk of the bread satisfies the craving of the patient for bread, and at the same time, enables him to ingest a larger amount of butter than if half the quantity of white bread were permitted. According to the same principle it is often of advantage to give diabetics very porous fluffy breads on account of their bulk; for they satisfy the appetite if they are cut in thin slices and buttered freely and at the same time satisfy the eye and the mind without injuring the stomach or the carbohydrate metabolism. Still another bread for diabetics that contains very much less carbohydrate than either ordinary white bread or bread made from gluten flour and wheat or rye flour, is almond meal bread made from ground almonds, containing about 7 per cent of carbohydrate, with the addition of butter, eggs, salt and spices. Unfortunately this bread is not very palatable, tastes more like cake than bread and hence is not well tolerated for an indefinite time by most diabetics.

plished without difficulty by supplying abundant fat. Should the patient begin to lose flesh upon the restricted régime, despite the ingestion of enough calories, or should very large quantities of acetone and its congeners, oxybutyric and diacetic acid appear in the urine, then the restricted diet is to be abandoned and some carbohydrate must be administered. Even if no untoward symptoms appear, however, it is generally better after four to six weeks of restricted diet to allow the patients some carbohydrate food for the sake of their appetite and general comfort; besides it is much easier to manage these cases, and above all to supply adequate caloric values in the food, if some bread, potatoes, rice or other starchy food is allowed.

Before the addition of carbohydrates to the diet of such cases the boundary of tolerance should be very carefully determined, as described above (see page 123). They should now be kept for a time upon a ration containing no more white bread than corresponds to an amount that is somewhat below the established boundary of tolerance.

Should sugar reappear again, then the amount of carbohydrate food should at once be reduced or stopped altogether until the urine becomes sugar-free again. If the patient bears the addition of white bread well for several weeks, and if no glycosuria supervenes, then he may safely be kept on this amount of white bread, *or its equivalent* (see Table III), for many weeks or months at a time. From time to time a period of restricted diet should again be instituted and the boundary of tolerance reestablished.

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70 gm. of zwieback.
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70 gm. of oatmeal.
120 gm. of dried peas, beans, lentils.
200 gm. of green peas.
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400 gm. of strawberries, raspberries, gooseberries, blackberries, cranberries, huckleberries.
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500 calories more than the average requirement and enough usually to compensate for any slight loss of sugar that may occur in the urine. If no alcohol is given the fat ration may be increased by 40 to 50 grammes.

Starvation plan

Occasionally it is impossible in this class of cases to produce complete disappearance of the sugar from the urine, even after the patients have been on a carbohydrate-free diet for nearly two months. In a case of this kind a very useful plan is the one suggested by Naunyn, viz., to starve the patients completely for a period of twenty-four hours, giving them during this time merely a little tea or coffee or bouillon, and plenty of water. After the fast the patient is placed for two or three weeks upon a carbohydrate-free diet, and it will frequently be found that now the sugar remains absent from the urine and that some tolerance for carbohydrates has been acquired.

Intermittent carbohydrate feeding

In view of the fact that no individual can, without great suffering, great discomfort and some danger, exist indefinitely upon a diet consisting exclusively of albumens and fats, it generally becomes necessary, sooner or later, to administer, even here, some carbohydrate food, even at the risk of promoting glycosuria for the time being. This plan should, therefore, be adopted intermittently, immaterial whether the carbohydrate-free diet caused a complete disappearance of sugar from the urine or not. Such patients, however, should never receive more than 100 grammes of white bread, or its equivalent, in the twenty-four hours.

Gradual transition from rigid to liberal diet

Change in kind of carbohydrate food

The advantages of single carbohydrate feeding

The transition from the carbohydrate-free diet to the more liberal diet should always be very gradual and the patients should receive each day a little more of the carbohydrate food until the 100 gramme limit is reached. If it is found that the glycosuria rapidly increases, then the carbohydrates should be gradually reduced and finally stopped again. It is usually a good plan to alternate the kind of carbohydrate food, i. e., to give for some days bread, then its equivalent in potatoes or rice or oatmeal, etc., and to give only a single carbohydrate at a time; for the mixture of several carbohydrates generally leads to a greater excretion of sugar than the administration of a single one. Each individual, moreover, reacts differently to different carbohydrates, so that tolerance determinations with oatmeal or rice or potato often reveal peculiar relations that may be advantageously employed in the treatment.

Based on this fact so-called "cures" for diabetes by feeding with large quantities of single carbohydrates have at different times been advocated. Thus we have had the *potato cure*, of Mossè, the *rice cure*, of von Dühring, the *milk cure*, of Winternitz, and more recently the *oatmeal cure*, of von Noorden. All these observers are reliable clinicians and good observers and all of them have reported a few cases that were decidedly benefited by this method of feeding. This is particularly striking, as the use of large amounts of carbohydrate food in diabetes is in itself paradox, and especially as the good results were as a rule observed in cases that were of the severe type, and in which the ordinary methods of dietetic, hygienic and medicinal treatment had failed. The oatmeal cure seems to yield proportionately better results than any of the other plans of feeding, and as I, personally, have had experience with the oatmeal cure alone, I will limit my remarks to it.

Oatmeal-cure.

The method of administering the oatmeal cure (as recommended by von Noorden) is the following: 250 gm. of oatmeal are cooked for several hours in water, to which a little salt is added; while the porridge is boiling, about 100 gm. of butter are added and later, after the boiling is completed and the mess is cooled, about 100 gm. of egg albumen, or a like amount of some vegetable albumen, may be added to the porridge while it is still on the fire. This soup is administered about every two hours during the day in such quantities that the whole amount is eaten in the course of twenty-four hours; in addition, the patient is permitted to take some brandy or claret and water or a little strong, black coffee.

It will readily be seen that it is impossible to continue this mode of dieting for a long time; the patients naturally soon acquire a distaste for the oatmeal soup and when this period comes the treatment will have to be stopped, as it is worse than useless to force it.

Results.

The results from this treatment are either brilliant within the first few days after it is begun, as manifested by a great reduction or the complete disappearance of the sugar and the acetone bodies from the urine, or they are altogether negative from the start. Therefore, in my experience, if good results—striking results—are not seen within three days it is probably better to discontinue the oatmeal cure and to resort to other measures. I have seen one or two bad consequences that I think can be attributed to the prolonged use of the oatmeal cure after an appreciable effect failed to appear within two or three days. This group of patients suffered a reduction of their tolerance for other carbohydrates, and above all, developed alarming degrees of acetonuria.

I am not as yet prepared from my own experience to state percentically how many cases are benefited, how many are not affected favorably, and how many are harmed by the oatmeal cure. I venture the statement, however, that if the rule is observed to stop the oatmeal cure if no good effects are seen within three days, the number of bad results will be reduced to insignificant figures. In about 35 per cent. of all my cases I have had good results, varying from a slight reduction of the acetonuria and a considerable reduction of the urinary sugar during the time the oatmeal treatment was administered, to remarkable improvement in very serious cases in which the sugar practically disappeared, the gain in weight was rapid and the reduction of the acidosis almost instantaneous, and in which, moreover, the after-effects of the "cure" were determinable for months after the patient had left the hospital.

It is interesting and important to note, as well, that the best results are obtained in juvenile diabetes, a form that is particularly intractable to ordinary methods of treatment, and that is particularly damaged by the old-fashioned routine treatment of feeding on a starch- and sugar-free diet. No case of juvenile or adolescent diabetes should be deprived of the benefits of an oatmeal cure. At the least the trial should be made, and if the "cure" fails, no harm will have been done, provided it is properly carried out and not forced after the third day if no results appear within that time.

DIETETICS OF THE SEVERE TYPE OF DIABETES.

Technique

In view of the fact that it is impossible in this form of diabetes to cause the complete disappearance of the sugar from the urine, even when the albumins of the diet are greatly reduced, especial care must be taken to compensate for the loss of sugar by increasing the ingestion of albumins and fats, for only in this way can adequate nutrition be maintained. For this reason less attention must needs be given to reducing the glycosuria than to maintaining the body weight, treating complications symptomatically and rendering these unfortunate cases comfortable. In this variety of diabetes, to which belong most of the juvenile cases, acidosis (and the excretion of acetone bodies) is usually very pronounced. This generally constitutes a danger, because in a large proportion of cases coma seems to be more liable to occur when the acetone body excretion is great than when it is absent or small, although there are many exceptions to this rule. Exclusive meat-fat feeding seems to favor acidosis and it will be found that the addition of carbohydrates to the diet of such cases often, although not invariably, causes a considerable reduction in the acetone-body excretion. If, therefore, such patients develop marked degrees of acetonuria, with oxybutyric and diacetic acid and much ammonia in the urine, then, above all, the exclusive meat-fat diet should be discontinued and, for the sake of safety and as a prophylactic measure against coma, carbohydrate food should be given even at the risk of increasing the glycosuria.

Acidosis in this type

Carbohydrates of little food value

In this class of cases carbohydrates, however, have practically no food value, because they are promptly re-excreted in the urine. They must be considered merely as a welcome addition to the diet and one that enables the patient to eat enough of the necessary albumens and fats to maintain nutrition. It will often be found that the complete withdrawal of carbohydrates not only destroys the appetite, but produces digestive disorders that are often fatal in their consequences. In general, these patients should be allowed considerable albuminous food up to 150 grammes, the maximum of fat, considerable alcohol and, in addition, about 50 to 60 grammes of bread or its equivalent. This liberal feeding should be interrupted from time to time by placing the patients for two or three or more weeks upon a rigid diet; then the carbohydrate portion of the food should again be gradually increased. One will often be gratified even in these severe cases to find that their tolerance for carbohydrates is greater after such a period of carbohydrate withdrawal than before. In this type of diabetes, par-

The albumen and fat ration

ticularly, careful metabolic studies, preferably carried out in an institution, are often of inestimable value in prolonging life.

The liquid intake

Smoking, chewing and atropine to allay thirst

The amount of fluid in this class of cases should be regulated in such a way that the specific gravity of the urine, broadly speaking, is kept up to, or brought down to, 1025. The liquid intake should in general be proportionate to the ingestion of albumens and the corresponding excretion of urea; for the urea largely determines diuresis. Excessive water drinking is to be condemned in severe diabetes on account of the danger of gastric dilatation and of the strain upon the heart and arteries that results from the abundant ingestion of water. Very often diabetics acquire the habit of drinking large amounts of liquid. They should be educated to control this craving and if necessary may be advised to chew gum or smoke a little in order to deaden the sensation of thirst. Atropine sulphate in one-two-hundredth grain doses also often fulfills a like purpose.

Fallacy of "forbidden" and "allowed" "diabetic diet."

It will be seen from all that has been said that the exact regulation of the diet in diabetes must vary according to the type and the degree of the disease, and according to individual peculiarities, the presence or absence of complicating diseases, the age of the patient and his ability or willingness to submit to rigid control. Consequently no mathematical formula, no "Diabetic Diet" giving "forbidden" and "allowed" articles can be arranged for feeding every case of diabetes. Until very recently the dangerous routine habit of placing each case of diabetes for indefinite periods upon a diet containing no carbohydrates was universally in vogue. As a result innumerable diabetics were literally starved to death. Nowadays we have learned, as shown above, that a diabetic not only can, but should, in the great majority of cases, at least from time to time, enjoy the benefit of carbohydrate feeding.

MEDICAMENTOUS TREATMENT OF DIABETES.

Inaccuracy of studies on drug effects in diabetes

The suggestive element

A large number and a great variety of remedies have at different times been recommended for the cure of diabetes. None, however, can exercise a curative effect upon the disease proper and only a few appreciably influence the excretion of sugar. Most of the reports on the effect of the different medicines that have been used in diabetes have been made without sufficient dietetic control, and for periods of time that were far too short to rule out the uncertainties that always arise in regard to the effect of a remedy in a disease that is subject to so many spontaneous fluctuations as diabetes. In interpreting, furthermore, the efficacy of any drug in diabetes, a disorder that, especially in its milder forms, is so markedly influenced by emotional and psychic states (see page 146), the element of suggestion must always be considered, particularly, when a new drug of much vaunted efficacy is tried for the first time.

Remedies that curtail the appetite and derange the digestion

Some of the remedies that are actually capable of reducing the glycosuria act by curtailing the appetite and by interfering with the assimilation of food. As soon as a patient, owing to such a drug effect, eats less food, especially carbohydrate or albuminous food, then the sugar excretion may very readily become reduced; incidentally, however, serious harm may be done the patient, owing to the malnutrition and the irritation of the gastro-intestinal tract, or the liver, that is produced by the medicine. Other remedies, again, exercise a beneficial effect upon certain functions of the liver, the cardio-vascular apparatus, and, above all, the nervous system, so that they possibly improve the general condition of the patient, act as a general tonic and hence actually enable him to destroy more sugar than before. These effects are, however, as will readily be understood, very indirect and in most cases transitory. One should, therefore, be especially careful not to place too much reliance on drugs in the treatment of diabetes, nor to misinterpret a temporary reduction in the sugar excretion as due to the drug effect alone, for otherwise the temptation may be created to neglect the all-important dietetic treatment.

General tonics

The fact that there is not, so far as we know to-day, any proper anti-diabetic remedy should not, however, discourage us from using those drugs that we know to be capable of favorably affecting the general health of the patient, counteracting or remedying complications or, above all, removing distressing or dangerous symptoms, chief among them the glycosuria. To enumerate all the drugs that have been recommended would be futile, so that only those may be discussed in this place that have empirically vindicated their claims to usefulness in the treatment of diabetes.

Opium and its alkaloids

Chief among the valuable drugs are opium and its alkaloids. By the aid of opium the last traces of sugar can, without doubt, often be removed from the urine in cases that do not become altogether sugar-free on a restricted diet. In cases of medium severity particularly, that are existing upon a restricted diet, but that still excrete some sugar, it often reduces the glycosuria. It does not, however, seem to exercise any appreciable effect upon the sugar excretion in diabetics who are eating carbohydrate foods. The effect of the drug can never be absolutely relied upon and its action is always uncertain; for occasionally it exercises no influence at all, even in the cases specified above. Its effect is never permanent; for when its use is stopped the glycosuria reappears and usually increases rapidly but to disappear again, everything else remaining equal, when opium is resumed. Many patients rapidly wear the drug off, so that the dose must be continuously increased if its effect upon the sugar excretion is to be maintained. Herein lies the chief danger from the use of opiates, especially if the patients know what they are taking.

The dose should be large from the beginning, i. e., at least half a grain (0.03 gm.) of the extract should be given three or four times a day, preferably in combination with the extract of belladonna, one-twelfth grain (0.005 gm.) or atropin sulphate, one one-sixtieth grain (1 mg.). Some clinicians prefer codeine, others morphine in appropriate doses, but in my experience the best effects are undoubtedly obtained from the extract of opium administered as above.

It is probable that opiates act chiefly by their sedative power and not by any specific effect upon the carbohydrate metabolism, although some investigations seem to indicate that opiates interfere with the dissassimilation of the tissue albumens and hence prevent the organism from splitting off sugar molecules from the tissue proteids. This would explain their good effect in patients living upon a carbohydrate-free diet in which the urinary sugar is undoubtedly derived from the catabolism of the albumens proper.

A number of other remedies have been given for their sedative effect upon the nervous system, chief among them, bromides, chloral, phenacetin, sulphonal, valerian, etc. Many of these drugs undoubtedly act beneficially in the neurotic or neurasthenic types of the disease (see page 146), but in most cases they are inert and do more harm than good by irritating the gastric mucosa and deranging the digestion.

Next in importance to the opiates are the preparations of salicylic acid, given either as sodium salicylate, in doses of from ten to thirty grains (0.6 to 2 gm.) or as aspirin, in doses of from thirty to forty grains (2 to 3 gm.) several times a day, after eating. These drugs act differently than the opiates, for their effect becomes apparent precisely in those cases that are eating some carbohydrate food; they seem to increase the boundary of tolerance for carbohydrate foods, and thus enable the patient to utilize more of the alimentary starches. These drugs, too, should be given in large doses, as indicated above, in order to do any good. They are strictly contra-indicated in diabetics suffering from gastric or renal disorders; and as many diabetics, especially of the severe type, suffer from these complications, their usefulness is limited. Some skeptics go so far as to claim that the salicylate preparations do good chiefly by deranging the stomach and hence interfering with the proper assimilation of food, and that they reduce the glycosuria in this way, simply because, upon their administration, less of the ingested carbohydrate pabulum is absorbed. It is hard to disprove this criticism.

Jambul

Dose and administration

Jambul occasionally acts very well in diabetes in a manner similar to the salicylates, i. e., it aids in increasing the boundary of tolerance. Its action, however, is very uncertain and its effect transitory. One can never predict in advance, therefore, whether or not jambul is going to be effective. Patients, moreover, wear this drug out very rapidly, so that if it is administered at all, it should be given interruptedly, i. e., for two or three weeks at a time and then not again until after an intervening period of at least four or six weeks. Leading authorities report sufficiently good effects from the use of jambul to warrant its trial in every case that does not satisfactorily yield to dietetic treatment, opium or salicylates. The drug may be given in the form of the dry powder in the dose of five to thirty grains (0.3 to 2 gm.) three or four times daily in capsules, gradually increasing the quantity until as much as an ounce (32 gm.) is given a day. A much more reliable and pleasant preparation is the maceration with water which may be prepared as follows:* 200 grammes of dried jambul fruits, including the seeds, are finely powdered and macerated in two litres of water (to which 10 gm. of salt and 4 gm. of salicylic acid are added) at 37° to 40° C. The watery extract is filtered off and 100 cc. of the fluid taken cold every morning on an empty stomach, and the same dose again in the evening before retiring. The salicylic acid is added merely as a preservative.

Alkalies

Mode of action

Alkalies are always useful in diabetes and I have made it a practice to give from five to thirty grains of sodium bicarbonate, or of calcium carbonate, two or three times a day to every case of diabetes for indefinite periods of time. Alkalies in the first place effectively aid in counteracting the acidosis that is so frequently met with in diabetes; in this sense a continuous alkali therapy may be considered a useful prophylactic measure against the development of severe acidosis, which notoriously often leads to the development of coma. Aside from their effect upon the acid intoxication alkalies must also be considered an hepatic stimulant (page 496), and there is much experimental evidence to show that they increase intracellular oxidation and hence, we must assume, promote the destructive metabolism of circulating carbohydrates.

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*Von Noorden.

Mineral waters

The effects occasionally derived from the use of many of the mineral waters, natural or artificial, that are so popular in the treatment of diabetes, must in large part be attributed to the alkalies they contain. To this category belong especially waters like Vichy, Marienbad and Carlsbad.

Life in Carlsbad, Marienbad, Vichy.

It is important, however, to appreciate that the benefits derived from a sojourn in Carlsbad or Marienbad or Vichy, or any of the other watering places, can only in part be attributed to the effect of these alkaline waters. The resort treatment of diabetes of certain types is without doubt highly beneficial; but this is due in great part to the careful regulation of the diet which can be carried out without hardship to the patient in such resorts; to the respite from worry and from the strenuous business life; to the out-door existence and the pleasure derived from a vacation in a pleasant watering place; not to speak of the benefits that accrue to the patients from placing themselves under the care of resort physicians who are usually particularly skilled and experienced in the management of this disease. There is one danger in the resort treatment of diabetes, viz., that many cases, particularly of the lighter type, imagine that a few weeks in Carlsbad, Marienbad or Vichy under a careful régime will neutralize the bad effects accruing from injudicious dieting during the rest of the year, so that many patients imagine that they can divorce themselves from all restrictions, provided they return to the resort for some months each year. This form of optimism is to be seriously discouraged. That the drinking of the waters in these resorts alone does not produce the beneficial effects in diabetes is made very apparent by the indifferent results obtained from their use if they are taken at home, bottled, or in the form of artificial salts.

Dangers of Resort treatment

Iodide of potash

Iodide of potash sometimes acts beneficially in diabetes, particularly in two types, viz., those that are due to arterio-sclerosis, possibly involving the arteries of the pancreas, and those that are due to syphilis (central lesions, syphilitic pancreatitis or hepatitis). The remedial action of iodides in arterio-sclerosis has been fully discussed in the section on this disorder. Their good effect as antiluetics is self-evident. Every case, therefore, presenting evidences of arterio-sclerosis, or presenting a suspicious syphilitic history, should be given the benefit of an energetic iodide treatment, care being taken, of course, above all things that the stomach and intestine are not deranged (see *Syphilis*).

Mercury

Mercury seems to act less beneficially in diabetes due to syphilis. This must be attributed to the fact that the diabetic manifestation in syphilis is always a late sign, presumably due

Bichloride of mercury

to arterial changes involving the central nervous system or the pancreas and producing degeneration of portions of these organs. Iodide of potash can here possibly be effective, whereas mercurials are usually without effect. Bichloride of mercury has been recommended, but the drift of opinion among reliable clinicians seems to speak against its efficacy. Given hypodermically it not infrequently produces disagreeable sequelæ, owing to the vulnerability of the skin and subcutaneous tissues in diabetes and the tendency in this disease to the development of skin lesions. Its use, therefore, had better be eschewed.

Intestinal antiseptics
Lactic acid
Creosote
Phenol preparations

Various drugs have been recommended whose efficacy should be attributed to their action as intestinal antiseptics, and symptomatically they occasionally do good. To this group belong lactic acid, creosote and other phenol preparations. Their effect is very uncertain and very little benefit generally accrues from their use.

Quinine
Arsenic
Iron

General tonics, such as quinine, arsenic and iron, are commonly used in diabetes. They occasionally improve the anemia and possibly stimulate the nervous system to increased activity, but I have never been convinced that they exercise any appreciable effect upon the course of diabetes nor upon the amount of sugar excreted in the urine.

Organo-therapy

Pancreas alone and combined with liver, muscle, salivary glands

Liver extracts

Brewer's yeast

Organo-therapy on theoretical grounds should be efficacious in diabetes. However seductive the use of pancreas preparations or of combinations of pancreas with muscle- or with liver- or with salivary gland-extract may appear, practically nothing of definite value has so far been observed from their administration. Pancreas is occasionally useful, as will be shown in another paragraph, in the treatment of the steatorrhea of diabetes, but it has no effect upon the glycosuria. I reported some cases in which the boundary of tolerance seemed to be raised by the use of pancreas-muscle extracts,[*] but observations made subsequently in a larger number of cases have failed to support the first observations. Liver extracts and brewer's yeast have been used, but the optimistic claims advanced in the beginning have never been vindicated, although yeast often favorably influences the furunculosis of diabetes. Nevertheless organotherapy appears to be a very hopeful field and while nothing tangible has so far been accomplished, we may hope some day to discover an efficient organo-therapeutic method of combating diabetes.

Substitutes for sugar

Among the drugs that may, finally, be used in the treatment of diabetes may be mentioned some of the preparations that take the place of sugar. To this group belong chiefly

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[*] New York Medical Journal, 1904.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] of fats is usually improved by taking a little alcohol, preferably in the form of brandy or whisky. Alcohol is particularly useful as a stomachic in diabetes and as a substitute for some of the fat in cases that are living upon a meat-fat diet. As a general heart and nerve tonic it also has its place, especially in patients who have been used to some alcoholic stimulant all their lives. In such individuals, especially if they are advanced in years, the withdrawal of alcohol is decidedly bad practice. More than forty to fifty grammes per diem, however, should rarely be allowed.

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*For the normal boundary of tolerance for different sugars see Croftan "Clinical Urinology," pg. 65.

EXERCISE IN DIABETES.

Importance of muscular exercise

In addition to the dietetic and medicamentous treatment of diabetes one should recognize that certain other elements in the general management of the disease are of great importance. Thus the amount of exercise that a diabetic takes should be carefully regulated. Muscular exercise by increasing the carbohydrate metabolism in the muscles is, in certain cases, capable of reducing the glycosuria. Light muscular exertion, partaking of the character of out-door sports, is always to be preferred to in-door calisthenics or forced exercises; for, in the former case, the pleasure derived from the exercise, i. e., the joyful psychic stimulation as well as the out-door life, both act beneficially. No violent exercise should be permitted, for in diabetes any over-strain is dangerous. The amount of exercise should be made altogether dependent upon the general nutrition of the patient, the condition of the heart, the blood vessels, the kidneys and the nervous system.

Control of exercise by the urine

The urine should always be carefully inspected in order to control the effect of exercise. As soon as the nitrogen excretion increases muscular exercise should be reduced or stopped; for, whatever benefits are to accrue from muscular exercise should become manifest by an increased destruction of *sugar*, i. e., by a reduction of the glycosuria, and not by an increased destructive of body *albumen*, i. e., by an increased excretion of nitrogen (urea). In order to obtain the optimum effect from exercise it is best to administer the carbohydrate ration, in cases living on a semi-restricted diet, immediately before muscular exercise is indulged in, and to continue the exercise for an hour or two thereafter; for it has been shown that during muscular exercise more of the sugar is consumed and utilized than during periods of rest.

Massage

If gymnastics or out-door exercises are contra-indicated on account of complications about other organs, then massage occasionally produces a very beneficial effect upon the excretion of sugar and the general well-being to the patient, although its effects are not by any means so striking nor so reliable. Here, again, the carbohydrate ration can to advantage be administered before the massage treatment is applied. In the severe type of diabetes very active muscular exercise must be eschewed. Such patients should be advised to lead a quiet life, both physically and psychically, for, in severe diabetes, as has been repeatedly stated, any strain and unrest, either emotional, mental or physical, should be avoided.

TREATMENT OF THE COMPLICATIONS AND SEQUELÆ OF DIABETES.

Most of the complications of diabetes disappear with a reduction of the glycosuria and an improvement of the general condition of the patient. Sometimes a more rigid diet must be ordered for a time, on account of complications, than would otherwise be administered, so that a mild type of diabetes, for instance, must be treated like a case of medium severity. Occasionally, however, it becomes necessary to employ special methods for the relief of very obstinate, very distressing or particularly dangerous symptoms.

Stomatitis
Gingivitis
Pyorrhea
Caries of teeth

Toilet of the mouth

The *stomatitis gingivitis, pyorrhea,* the loosening and caries of the teeth may be due either to localized infections or to tropho-neurotic influences. These mouth manifestations are among the most distressing symptoms of diabetes and it is important that every case of diabetes should, from the beginning, be instructed carefully in regard to the possibility of mouth complications, and taught how to attain mouth asepsis and to perform the proper toilet of the teeth and gums. After each meal a diabetic should rinse his mouth and cleanse his teeth, preferably with a 3 per cent. solution of sodium carbonate in warm water to which may be added as a flavor a few drops of the tincture of eucalyptus or a little menthol. Mechanical irregularities of the teeth should be corrected early, by choice during the aglycosuric period. All articles of food that can mechanically scratch or injure the gums and very hot beverages should be forbidden. A hard tooth brush should never be used.

Fetor

Excessive *fetor* may be corrected by using the following mouth wash:

℞

Beta-naphthol,	0.2 gm.
Sodium biborate,	20.0 gm.
Pepermint water,	200.0 cc.
Distilled water,	1000.0 cc.

M. Sig. Apply locally.

Bleeding and painful gums

If the gums are painful and bleeding the following mouth wash is useful:

℞

Tincture of opium,	20.0 cc.
Chlorate of potash,	
Biborate of soda, each,	10.0 gm.
Decoction of marshmallow root,	1000.0 cc.

M. Sig. Apply locally.

Skin lesions

The care of the *skin* is always of great importance in diabetes on account of the tendency shown in this disease to the development of furunculosis,* erysipelatous infections, acne, eczema and gangrene. Lukewarm baths, preferably with the addition of soda or of salt, are exceedingly useful. Following such a bath the patient's skin should be carefully dried with soft warm cloths and treated with cocoa butter or oil. Severe rubbing, owing to the vulnerability of the skin, should always be avoided. Patients with diabetes should frequently change their underwear and the greatest cleanliness of the surfaces of the body should be promoted.

Pruritus

Pruritis, either general or localized, especially about the genitals, is one of the earliest, most distressing and most obstinate symptoms of diabetes. General pruritus is presumably due to irritation of the cutaneous nerves by circulating sugar. In most cases its intensity fluctuates with the degree of glycosuria and the symptom frequently disappears without further interference when the urine becomes sugar-free, only to reappear again, however, when more liberal carbohydrate feeding is instituted and the hyperglycemia increases. The best remedy for internal use and almost a specific is sodium salicylate, in doses of thirty grains (2 gm.) several times a day. Local applications are of very little value in general pruritus.

In pruritus around the genitals, due in many cases to the development of fungi (*mycosis vulvæ*) and usually due to leptothrix, the reduction of the glycosuria, sodium salicylate internally and anodyne powders or ointments applied locally usually relieve. A 5 per cent. cocaine ointment or a 3 per cent. eucaine ointment, or a dusting powder containing 10 per cent. of orthoform, combined with frequent washing of the parts without rubbing or scratching, usually promptly produce relief.

Dyspeptic symptoms

Dyspeptic symptoms arising in the course of diabetes always call for particular attention. First, because diabetics more than sufferers from any other disease are dependent for the maintenance of their existence upon an intact gastro-intestinal tract. Second, because dyspepsia, especially in severe types of diabetes, is frequently a precursor and a determining factor in the development of coma. Dyspeptic symptoms not uncommonly arise from monotonous, one-sided feeding, e. g., from an excessive meat-fat diet, or simply from over-loading the stomach with food (polyphagia) or water, with resulting functional over-taxation and mechanical dilatation of the stomach with all that entails.

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*Yeast internally is in some cases an efficient remedy against diabetic furunculosis. (See page 137.)

Gastric irritation

In very severe cases of *gastric irritation* the best plan of all is to withdraw food completely for a period of twenty-four hours, allowing merely a little broth or diluted milk or a little claret in water, at the same time feeding the patient by rectum (see p. 367). In order to allay the gastric hyperalgesia and the vomiting, cerium oxalate in ten grain doses, frequently repeated, or cocaine, as described on page 19, or 2 per cent. chloroform water should be given, while cold or hot applications, according to the likes of the patient, should be applied over the epigastrium. The severe thirst that usually appears during the period of food- and drink-restriction can, to some extent, be mitigated by allowing these patients to chew gum, to swallow small pieces of ice at frequent intervals, or even to smoke a little.

After this rest cure for the stomach the patient should be put for a day or two upon milk and gruels composed of almond meal or gluten-flour and then gradually the broad dietary resumed, care being taken all the time that the maximum of food is introduced by rectum in order to maintain general nutrition.

The more *chronic dyspeptic disorders* in diabetes call for careful analysis of the gastric function and for treatment that does not materially differ from that described in the Chapter on *Diseases of the Stomach.*

Catarrh of the bowel

Catarrh of the bowel is always serious in diabetes. Acute catarrh with profuse diarrhea should be attacked most energetically in every case; for the interference with food assimilation that results, rapidly weakens the patient and not infrequently directly precipitates coma. Bismuth subnitrate in doses of fifteen to twenty grains (1 to 1.3 gm.), with extract of opium one-half grain, and tannic acid suppositories containing about three grains (0.2 gm.) of the drug, should be given at frequent intervals until the diarrhea is checked. An attempt should be made to feed the patient by mouth as soon as the bowel movements are controlled. During the diarrhea brandy and water should be frequently given by mouth, in small doses, by preference ice cold, both to support and, in a measure, to nourish the patient.

Fatty diarrhea

Fatty diarrhea (steatorrhea) is not uncommon. Here possibly the involvement of the pancreas and hepatic insufficiency can be held responsible for the condition. The fats in the diet should be reduced. Sodium carbonate or calcium carbonate, in ten grain (0.65 gm.) doses with pancreatin or ox-gall, of each five grains (0.3 gm.), should be administered at frequent intervals during the day.

Constipation

Obstinate constipation is also often a troublesome and a dangerous complication. It, too, not infrequently precipitates coma if allowed to persist. Here absorption of bowel poisons from stagnation and putrefaction of bowel contents must be accused of determining the attack of coma. Usually abundant fat-feeding and the restriction of carbohydrates suffice to counteract the constipation. Saline waters or a lemonade made of

Glycerin 3 parts,
Citric acid 5 parts,
Water 1,000 parts,

the whole quantity to be administered in divided doses during the day, are all useful measures.

The best medicines to counteract the constipation in diabetes are rhubarb and soda mixtures, either Mistura Rhei et Sodæ two drachms to three ounces (8 to 100 cc.) or the following powder:

℞
Rhubarb root,
Sodium bicarbonate,
Sulphur, precipitated, of each 10 grains (0.6 gm.)
M. Sig: To be taken at night, preferably in milk.

If these measures do not regulate the bowels, then castor oil or the Compound Infusion of Senna may be used to advantage.

Complications about the heart, arteries, lungs, kidneys

Complicating *affections about the heart and arteries*, the *lungs* (tuberculosis) and the *kidneys* that arise in the course of diabetes must all be treated according to the principles described in other chapters. It will rarely become necessary to deviate materially from the general dietetic schedule on account of these complications. The simple rules that should be occasionally observed have been mentioned in the text. If evidence of severe renal disease appears, especially if the cardio-vascular apparatus becomes involved, then the diabetes must be relegated to secondary importance, and the treatment should be chiefly directed towards the cardio-renal disorder according to the principles laid down in the Section on *Nephritis* (see page 204f). The complication of diabetes with obesity, and diabetes with the uric acid diathesis, are discussed in their appropriate places.

Obesity and gout

Neuralgias

Among the most distressing secondary symptoms of diabetes are the *neuralgias*, especially about the sciatic nerve and the brachial plexus; and a variety of other nervous disorders manifesting themselves either as sensory or motor disturbances, or,

Trophic disorders

above all, as trophic disorders. Among the latter perforating ulcer and gangrene, herpes, pemphigus and glossy skin, brittleness of the nails, loss of hair and teeth and diabetic neuritis may be mentioned.

The symptomatic treatment of the neuralgias is rather unsatisfactory, for the ordinary anti-neuralgic remedies rarely suffice to control the pain. The best combination of drugs, in my experience, is quinine and opium, given as follows:

℞

Quinine sulphate,	10 grains (0.65 gm.)
Extract of opium	¼ grain (0.0015 gm.)

M. Sig. In a capsule repeated three or four times a day.

Antipyrin, in five grain (0.35 gm.) amounts, is also occasionally of service, especially as it seems to exercise some effect upon the glycosuria. Generally speaking, the majority of the nervous disorders yield spontaneously if the hyperglycemia can be reduced, so that attention should chiefly be directed towards the treatment of the underlying diabetic disorder.

COMA.

Prevention of coma

The administration of alkalies throughout the course of diabetes as a prophylactic measure against coma has already been mentioned (see page 135). With the appearance of the first signs of coma, especially in cases that have been living for some time upon a rigid meat-fat diet, some carbohydrate food should at once be administered. I have even occasionally practised the intravenous injection of levulose, a sugar that some diabetics can burn with facility (see page 134), and I can testify from personal experience to an occasional good symptomatic result from this practice. Inversely, coma may sometimes be averted in a patient living upon a very liberal diet by great restriction of the carbohydrate food. The sudden withdrawal of carbohydrates from the diet, i. e., placing the patients at once upon a meat-fat diet is always dangerous; for coma has many times been produced by this course. We are unable to explain these peculiar, apparently paradoxical phenomena, but empirically they are certainly true.

Treatment of the attack

In fully developed coma the patients are usually semi-conscious or comatose; there is generally severe vomiting and other gastro-intestinal disturbance, so that dietetic rules, even if they would lead to any result, could not be carried out. The treatment here lies along different lines. Diabetic coma is always an exceedingly dangerous and usually a fatal complication, and almost all the measures that we can employ unfortunately merely fulfill the purpose of partially reviving the patient and postponing the fatal issue for a short time. The patient in the first stages of diabetic coma should be put to bed and forced if possible to drink milk or large quantities of lemonade. At the same time the action of the heart should be supported, either by alcohol, which acts also as a food, given by mouth, or camphor (10 per cent. solution in oil or ether), or ether injected subcutaneously. Oxygen should be administered, for it often relieves the dyspnea. The most important remedy to administer, however, is sodium carbonate. It should be given by mouth, by rectum, by hypodermoclysis and intravenously, in 3 to 5 per cent. solution in normal salt. However large the dose of soda the urine rarely loses its acidity, and whereas 5 gm. per diem normally always suffice to render the urine alkaline, over 100 gm. may not do it in coma. A diabetic patient in coma cannot get too much soda.

GANGRENE.

Gangrene

It is one of the most distressing and dangerous complications of diabetes. When it is once fully established amputation of the affected member becomes necessary. Most surgeons recommend dressing the gangrenous extremity with a moist boric acid solution and awaiting the appearance of the line of demarcation before performing amputation. In a diabetic gangrene, particularly, the amputation should be performed high up in the region of healthy arteries. With the appearance of gangrene the diet should never remain altogether carbohydrate-free. It is always better to allow from 50 to 100 gm. of white bread or its equivalent. Occasionally prophylactic treatment should be instituted, especially in old people or in alcoholics, or in individuals with marked arterio-sclerosis, who complain of certain premonitory signs like continuous pain, tingling or hyperesthesia in some extremity. Here everything should be done to promote the venous back-flow from the affected member. Hot foot-baths and massage should be energetically instituted, while, at the same time every effort should be put forward to reduce the glycosuria.

PROPHYLACTIC AND CAUSAL TREATMENT IN DIABETES.

Hereditary element

A few words may be added in regard to prophylactic and causal treatment in diabetes. In many cases of diabetes an hereditary element is very apparent. The disease runs in families and if diabetes itself does not appear in the ancestry of a diabetic, then one will often discover one or several members of the family who suffer from obesity or gout. If several members of a family are diabetic, or if there is a tendency to obesity or gout, then all the members of such a family should be warned against over-indulgence in carbohydrate foods. Their urine should be examined at intervals of at least six months for the appearance of sugar. Particular care should be exercised in this direction in individuals of such families who are obese or are rapidly becoming obese, for in them frequently the deposit of fat in the tissues may almost be considered a precursor of diabetes; the sugar in such cases, one must assume, being converted into fat and deposited in the tissues instead of being wasted as sugar in the urine.

Test for alimentary glycosuria

In order to make quite sure that a tendency to diabetes is not developing in individuals with an hereditary tendency, the test for the presence or absence of an alimentary glycosuria may to advantage be made from time to time. This is carried out by giving such subjects 100 to 150 grammes of dextrose at one time on an empty stomach. In a normal subject no sugar should appear in the urine after this test; if the tolerance for sugar is reduced, then glycosuria will appear. This warning should never be neglected and as a prophylactic measure the carbohydrate foods should be somewhat restricted and the use of sugar and sweets temporarily reduced to a minimum. At the same time such individuals should be instructed to indulge in abundant muscular exercise and to live as much in the fresh air as possible. Very obese subjects should be submitted to a careful reduction cure, as described in the next section.

Cases of this kind, in which diabetes is suspected from the family history and in which the test for alimentary glycosuria gives a positive reaction, are fortunate exceptions; fortunate, because at this early stage proper treatment generally quickly restores normal conditions and prevents the development of true diabetes. As a rule diabetes develops without warning or sugar is discovered by chance during a life insurance examination or in the course of some ailment that calls for an analysis of the urine, so that an opportunity for prophylactic treatment is unfortunately rarely offered.

Causal treatment

Causal treatment is not very satisfactory in view of our ignorance of the precise nature of the disease and on account of the manifold character of the causes that determine its onset. There are certain cases of diabetes that develop on the basis of a neurasthenic tendency. This form, it appears to me, is particularly common among Jews. The sugar excretion of these cases is frequently increased by worry or emotional strain, and decreased by joyful emotions or success and happiness. Here causal treatment must clearly be directed towards the underlying neurotic taint, with the aid of certain nerve tonics and sedatives (see *Medicamentous Treatment*, page 132) and those other means that are described in full in the Chapter on *Gastric Neuroses.*

Neurotic diabetes

Diabetes in organic nervous diseases

In organic disorders of the nervous system, that is, in tumors, hemorrhagic foci, cysts or other lesions in the region of the "glycosuric centre" in the medulla, and possibly in other areas of the brain and cord, the prognosis is dependent altogether upon the nature of the underlying lesion; and treatment is successful only in so far as it can remove the mechanical cause producing the disorder.

Syphilis

Provided the lesion in the nervous system is syphilitic, or if there is a suspicion of syphilitic interstitial pancreatitis or hepatitis, then energetic antiluetic treatment, as discussed in another portion (see page 594f), is occasionally fraught with success. Inasmuch as syphilis of the nervous system, the pancreas and the liver, as well as arterial degeneration due to syphilis, may all occasionally produce diabetes (the latter by producing secondary nutritional, i. e., degenerative, changes in the pancreas, medulla, etc.), every case of diabetes giving a syphilitic history should be granted the full benefit of long continued and persistent anti-syphilitic medication. The results obtained from such treatment are frequently exceedingly gratifying.

II. OBESITY.

Importance of reducing obesity

The reduction of obesity is an important therapeutic task, not so much when considered in the light merely of a tribute to the vanity of the afflicted, but chiefly when regarded as a necessity in order to remove an over-growth of adipose tissue leading to disagreeable and dangerous complications about important organs. It will often be found that these complications only disappear when the fat is reduced. We see here similar conditions as in diabetes, for there, too, many of the complications rapidly disappear when the sugar is reduced. Whereas in diabetes the causes that determine these complications are chemical, in obesity they are mechanical in character.

The organs most frequently and most seriously affected in obesity are the heart and arteries, the bronchi, the digestive apparatus, the nervous system and the skin.

Complications about the heart

Upon the heart is always thrown an enormous amount of excessive labor. First, because the body is heavier and locomotion requires more labor. Second, because a much larger vascular area than in a normal subject must be supplied, owing to the intricate labyrinth of new blood vessels that forms in the adipose tissue. Third, because the development of fat in the mediastinum and around and within the pericardium exercises mechanical pressure upon the heart and hence interferes with its action. Fourth, because fatty degeneration of the vessel walls very often occurs, with loss of elasticity and consequently an increased strain upon the heart muscle. Fifth, because owing to the development of abdominal fat the excursions of the diaphragm are seriously interfered with and there is a general contraction of the thoracic space with a reduction of its suction

Fatty degeneration of the heart and arteries

action, and hence a general embarrassment of the venous circulation. Lastly, because either as a result of all this over-strain, or as a part phenomenon of the general obesity, fatty infiltration or fatty degeneration of the heart muscle itself occurs.

As a matter of fact the affliction of the heart is probably the most serious consequence of obesity; for most obese subjects suffer from cardiopathy and die from heart failure. If, moreover, they should become affected with some intercurrent infectious disease, as pneumonia, typhoid fever, tuberculosis, etc., then the resisting powers of the heart are so slight that death commonly occurs from failure of the organ.

The involvement of the heart in obesity leads to the closing of a vicious circle; for the weak heart action produces an inadequate blood supply to various portions of the body with insufficient nutrition of muscular tissues and general lassitude, all factors that in predisposed subjects favor the development of obesity; on the other hand, as soon as obesity appears, it in its turn reacts unfavorably upon the heart.

Complications about the respiratory apparatus

About the respiratory apparatus serious disorders are also very common. The fat in the mediastinum and the increased weight of the chest walls, the impediment to the downward excursions of the diaphragm that is created by the over-growth of abdominal fat, all seriously interfere with the freedom of the lungs and the ventilation of the thorax. As a result rapid breathing, especially on exertion, dyspnea, and above all, chronic bronchial catarrh are very common in obesity. The bronchial catarrh is due in part also to the venous stasis that results from the cardiac insufficiency. The mucus is, as a rule, very tough and difficult to expel. The patients cough terrifically, usually without much relief, as expulsion of the mucus is rendered hard by the emphysema and the venous stasis in the lungs and by the difficulty of expanding the chest as a preliminary to the coughing effort. This condition again imposes a severe strain upon the heart, especially the right heart. The bronchitis in obesity rarely yields to the ordinary remedies, but is promptly bettered if the obesity is reduced and the condition of the heart improves. In obesity there is, therefore, also from this source again, danger of pulmonary infections and many of these cases succumb to catarrhal pneumonia, and, notably, to tuberculosis. There is a popular prejudice to the effect that obese subjects are not very susceptible to tuberculosis; if tuberculous infection occurs, however, it usually goes very hard with fat patients, and they constitute a large proportion of the instances of so-called "galloping" consumption.

Dyspnea

Chronic bronchitis

The disorders about the digestive apparatus are manifold in

Digestive disorders

Hemorrhoids

Constipation

character. Most of them are due to the venous stasis that results either directly from the heart weakness or indirectly from portal stasis. The most common intestinal symptoms in obesity are hemorrhoids and constipation; both are almost invariably present, the former due either to the portal stasis or to general interference with the venous backflow into the abdomen, the latter due to the pressure of the fat masses within the abdomen upon the bowel, causing interference with their peristaltic action; besides there is always much difficulty in voluntarily raising the abdominal pressure sufficiently to promote normal defecation. The one-sided diet with the elimination of much fat and carbohydrate pabulum may also have something to do with constipation in obesity.

Fatty infiltration of the liver

Cirrhosis hepatis

Fatty infiltration of the liver, combined with stasis and later cirrhosis, is not uncommon. Cholelithiasis and dislocation of the liver are not common during the stage of obesity, but frequently follow rapid reduction cures, owing to the fact that the support of the abdominal fat is rapidly withdrawn, and malposition of the liver and bending or knuckling of the gall-ducts is produced.

Skin affections

About the skin a variety of irritative disorders, complicated by secondary infections, are frequent. They are due both to the friction of abnormally enlarged adjacent parts of the body and to the profuse sweating that most obese subjects are afflicted with. The sweating is attributable presumably to an effort on the part of the organism to get rid of surface heat by water evaporation from the skin, especially as normal radiation is interfered with on account of the thick adipose layer that conducts heat so badly. Obese subjects frequently suffer from intertrigo, eczema, furunculosis, carbuncles and sudamina; besides, the skin often becomes torn in its lower layers leading to the formation of striæ, while, at the same time capillary hemorrhages, venous ectases, are frequent and varicose veins in various parts of the body make their appearance.

Nervous disorders

Phlegmatic temperament

About the nervous system, finally, a great variety of functional disorders, many of them of a neurasthenic type, are common. Most of them are due to the inadequate blood supply to the brain that results from the heart weakness. Apathy and a phlegmatic temperament are notoriously common in obesity. These psychic attributes, combined with what is popularly interpreted as a good-natured disposition, are presumably a result of the bulk of the individual; for, with the difficulty of moving about freely, and an inability to speedily carry the dictates even of an energetic will into rapid execution, habits of listlessness, laziness and indifference are easily engendered, so that after a time the bodily condition becomes reflected in the temperament.

More serious manifestations about the nervous system are apoplexies, especially in patients with a weak heart and arteriosclerotic arteries, who are suffering from such conditions as bronchitis, constipation, etc., which call for violent straining efforts.

I have summarized the various complicating disorders in obesity somewhat at length, because from a therapeutic standpoint it is exceedingly important to recognize the etiologic rôle of obesity in these various states. Treatment directed towards them symptomatically is usually futile and intelligent therapeutic effort must concern itself chiefly with removing the underlying cause, namely, the obesity. I will have occasion to refer to this form of treatment again in the different sections when discussing diseases of the heart and bronchi, of the bowel and the liver.

Obesity and joint affections

The importance of reducing obesity in a variety of chronic joint disorders may finally also be mentioned; for here the reduction of the bulk of the patient by relieving the joints of the labor of supporting a large mass acts in the same way as a mechanical support. Thus the reduction of obesity is a particularly grateful procedure in chronic rheumatic and gouty forms of arthritis.

The three forms of obesity

As in diabetes, one can conveniently distinguish three degrees of obesity that have been aptly characterized by a German writer as the enviable, the comical and the pitiable stages. The first presenting itself as a pleasing rotundity: the second, as a jovial embonpoint of the Falstaff type; the third as a sad, unwieldy, and to our Caucasian tastes, disgusting deformity. Each of these three forms requires particular treatment. In the first form no attempt need be made to reduce the amount of fat but every effort should be put forward to prevent its further development, particularly if premonitory signs of complications about the thoracic or abdominal organs begin to make their appearance. In the second and third forms, however, it becomes necessary to institute more or less energetic restrictions with the object in view of causing a loss of fat.

Diet and exercise

The methods at our disposal for accomplishing this purpose are chiefly dietetic. Second in importance is the regulation of the muscular exercise. These two means, singly or combined, usually suffice to accomplish the desired purpose, for with a decrease of the intake of fat-forming pabulum, and an increase of its destruction by exercise, the fat content of the body must needs dwindle. These measures may to advantage be enforced by certain hydro-therapeutic and medicinal means, the latter finding their chief sphere of application, however, in the symptomatic treatment of the complications of obesity.

THE DIETETIC TREATMENT OF OBESITY.

Physicians until recently, and the laity to this day, have directed their attention chiefly to the quality or the preparation of the food in reducing obesity. Certain articles were said to form fat and others not. This idea is erroneous. Broadly speaking, carbohydrate and fat foods should be reduced, and not the albumens. This rule is to be observed not because albumen "forms" less fat than carbohydrates or fats, but because the reduction of the albumen below certain normal average requirements, as will be explained below, is a dangerous and precarious procedure, whereas the fats and carbohydrates can be much reduced without detriment to the individual.

The quality of the food and its mode of preparation

One may say, axiomatically (but with certain restrictions that need not be discussed in this volume),[*] that any article of food can form fat according to its caloric value (see page 114), that if more calories are introduced either in the form of albumens or of fats or of carbohydrates, than are required to maintain normal nutritive equilibrium, then fat will be deposited in the tissues; and if less are introduced, that then the organism will promptly attack first its fat reserve to make up the caloric deficit.

The quantity of the food

THE SCIENCE OF REDUCTION CURES.

The initial procedure in instituting a reduction cure should be to determine the normal caloric requirement of the individual, *assuming that he were not obese*. This can be done by consulting the following table on which will be found the normal average weight for individuals of a certain height, both men and women: (Quetelet.)

Age, Years.	Men. Height, (In Meters).[**]	Weight, (Kilogrammes).[***]	Women. Height,	Weight, (Kilogrammes).
0	0.5	3.2	0.49	2.91
1	0.7	9.45	0.69	8.79
2	0.77	11.34	0.78	10.67
3	0.86	12.47	0.85	11.79
4	0.92	14.23	0.92	13.00
5	0.99	15.77	0.98	14.36
6	1.05	17.24	1.10	16.01
7	1.11	19.10	1.15	17.54
8	1.16	20.76	1.18	19.08

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[*] See my forthcoming book on "*Diseases of Metabolism.*"

[**] 1 meter—39.37 inches, or 1 yard 3 1-3 inches (English).

[***] 1 kilogramme—2 lb. 3 oz. 2 dr. (avoirdupois).

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The first degree

The rapidity with which fat is lost in these three degrees of reduction cures varies. In the first degree the loss is usually very slow, the patients rarely losing more than two or three pounds a month; and even this slight reduction can only be accomplished if they indulge at the same time in considerable physical exercise. The four-fifths diet is useful chiefly in preventing the further increase of fat in subjects who are showing a tendency to obesity. It is eminently suitable for continued use and does not require any great sacrifice on the part of the patient. It is hardly ever necessary to calculate the caloric value carefully in this light form, all one has to do is to allow less meats, to reduce the amount of fat and starchy and sweet foods somewhat, to restrict or forbid alcoholic beverages, to give "filling" foods of small caloric value (see page 116) in abundance, to restrict the liquid intake to one to one and one-fourth litres of fluid a day, and to order abundant physical exercise.

The second degree

The second degree is also particularly useful for continued use. It should be adopted, first, for very strong and very fat subjects who want to get rid of surplus fat and can safely indulge in very active physical exercise; second, for individuals who not only are fat but in whom complicating disorders about the heart, arteries, bronchi or digestive apparatus render it impossible to "work off" fat by exercise; here the necessary reduction of the fat must be brought about, in the beginning and until the complications improve or disappear, by dietetic restrictions alone; third, for fat individuals who cannot at once tolerate a third degree reduction cure without developing alarming symptoms of weakness, particularly about the circulatory and muscular apparatus. In the latter class of cases the three-fifths reduction cure is used as a transition diet to the third degree and is intended to gradually accustom the patients to restrictions of a more severe order to be instituted as soon as some fat is lost and the complications have improved. This second degree, too, leads only to relatively slight and slow losses of fat, more than six to ten pounds rarely being sacrificed a month.

The third degree

The third degree, finally, is a rapid reduction cure. It must be carefully supervised and is best carried out in an institution. Here we frequently find that the loss of fat is rapid in proportion to the obesity of the individual, showing that it is the surplus adipose tissue that is being sacrificed and not the albumin of the body. Combined with systematic exercise and drink restriction (see below) as much as thirty pounds a month can be lost with safety. A reduction cure of the third degree should never be carried out for indefinite periods, and six weeks is the longest time during which this serious restriction of the patient's nourishment should be allowed. In many cases the intermittent plan will have to be adopted, i. e., the patients are placed for four to six weeks upon the rigid plan, then for a month or two upon the second degree, and then back again to the rigid diet until the desired loss of flesh has been produced.

It will be seen that here very similar principles are adopted as in the reduction of diabetic glycosuria, where, too, three degrees of diabetic diet can be conveniently arranged (see page 124). While it is true that energetic starvation often rapidly leads to a loss of weight greater than that which can be accomplished by more gradual and more moderate means, such rapid reduction cures, as typified for instance by the Banting system, which is so popular among the laity, are rarely without serious danger to the various organs that are commonly involved in advanced degrees of obesity; nor are the results, broadly speaking, permanent.

Danger of reduction cures in young and old subjects

In very young people and in very old people rapid reduction cures should be altogether eschewed; for in children and in adolescent subjects irreparable damage is often done, growth stunted and serious complications engendered; whereas, in old people, the results are usually very unsatisfactory and never without danger, while the effects at best are exceedingly transitory.

The kind of food

THE ART OF REDUCTION CURES.

Importance of protecting the tissue albumens

The kind of food that should be allowed in instituting any reduction cure, and its mode of preparation, has been the subject of much controversy for many years. The greatest care should be exercised not to attack the albumen content of the body; hence it is important to give a certain amount of albuminous food to all cases in order that the patients may not be forced to consume the albumen of their proper tissues. As the known minimum necessary for maintaining adequate nutrition lies somewhere between 60 and 80 grammes a day, this amount at least should be invariably supplied. This corresponds to 400 to 600 grammes of lean meat (see below). No difficulty should be experienced in meeting this requirement. Notwithstanding the claims of some doctrinaires, excessive meat-feeding [illegible] unnecessary, but may be directly harmful in insti- [illegible] cures. A great deal will depend upon the [illegible] revious habits of the patients. If they have [illegible] meat-eaters, there is no reason why they [illegible] eat much meat. If they have been abundant meat-eaters, they may safely continue meat-eating, provided the intake is not so large that the total caloric value of the food is increased above the prescribed and calculated limit.

Restriction of fats and carbohydrates

The next question to decide is whether the carbohydrates or the fats are to be chiefly restricted. Here, again, a very virulent controversy has been going on for many decades. This is not the place to enter into a discussion of the merits or demerits of the different theories advanced. From a practical standpoint it is best to reduce the fats and to give relatively large quantities of such carbohydrate foods as possess bulk; for the latter, as a rule, incorporate a small caloric value, while, at the same time, fully satisfying the patient. The idea that fat forms fat in the body more than carbohydrate has been shown to be erroneous; as a matter of fact, carbohydrates seem to be more rapidly deposited as reserve fat in the tissues than the fat that is eaten.

Summary

To summarize, therefore, the diet in reduction cures should be arranged in such a way that the individual receives an amount of albuminous food incorporating at least 60 to 80 grammes of albumen. This is necessary in order to maintain nitrogen equilibrium and to protect the tissue albumen. The remaining number of calories that are to be supplied, according to the principles discussed above, may be vicariously furnished, either in the form of fats or carbohydrates. Of the two the carbohydrates, however, especially if they are voluminous, should be given the preference.

Distribution of meals

The distribution of the meals is sometimes of importance. The best plan is to give three meals during the day and, in addition, two or three small meals between, the latter preferably consisting of articles like bouillon, coffee or a little fruit, that possess a small caloric value. They serve the purpose of keeping the patient comfortable, avoiding disagreeable sensations of weakness and gastric emptiness, and, at the same time, preventing the patient from becoming too ravenously hungry at meal times and consequently from over-eating.

Restriction of liquids

One other important principle must be observed in the feeding, viz., the liquid intake should be restricted. Nothing is easier than to rapidly reduce the weight of an obese subject by restricting the liquid intake to a minimum. This loss of weight becomes particularly apparent during the first four or five days of the cure. It is due, in the first place, to a direct loss of water from the tissues; in the second place, to the fact that an individual drinking very little water does not eat as much as one taking a normal amount of liquid. The restriction, therefore, in the beginning is a useful procedure, more for

Suggestion effect

psychic than for physiologic reasons; for the patients when they notice how rapidly they are losing flesh, acquire that confidence in the method that is so important if they are to carry out the more or less disagreeable and stringent orders that must be given. No permanent effects, however, are obtained from this restriction of liquids, and the patients regain their weight as quickly as they lost it, as soon, namely, as they begin to increase water-drinking. Nevertheless, even in cases in which the restrictions are to be continued for a long time, a reduction of the total liquid intake to about one to one and one-half litres in the twenty-four hours is a useful adjuvant. It renders it easier for the patients to live up to their restrictions and it is also beneficial in advanced cases of obesity with complications, because it spares the heart and kidneys. In cases, finally, that suffer from excessive sweating, the restriction of liquids is also a very useful procedure to remove this disagreeable symptom.

Alcohol

Alcohol may be administered to obese subjects, provided the caloric value of each gramme of alcohol (1 gramme=7 calories) is carefully included in the calculation. It should be allowed particularly in cases that have been accustomed to a little alcohol all their lives; for here withdrawal of alcohol is not only an unnecessary hardship, but may even constitute a source of danger, especially if a weakened heart is suddenly robbed of its usual stimulus.

Special articles of diet

A few words may not be amiss in regard to certain special articles of food that are of particular value in the dietetic treatment of obesity.

Meats

In selecting meat for obese subjects lean varieties should be given the preference. Lean meat contains about 20 per cent. of albumen and 1.5 to 2.0 per cent. of fat, so that 100 grammes of lean meat, weighed raw, furnish about 100 calories. It is necessary, of course that the meat should be prepared in a very simple way, i. e., that it should be either stewed, roasted or broiled. All meats that are prepared by frying, or that are served as ragouts or with bread crumbs, sauces and gravies, of course contain incalculable amounts of fat, so that their caloric value may assume very large proportions. It is always best, therefore, to forbid the use of any but lean meats, plainly prepared.

Delicacies

Among the animal foods that an obese subject can eat with impunity are a number of delicacies that are taken only in small quantities and, on account of their flavor, are very agreeable additions to the diet; thus according to a table published by von Noorden, 100 calories are contained in:

45 grammes of caviar.
40 grammes of sardines.
100 grammes of boiled lobster.
160 grammes of crab meat.
120 grammes of oysters (equal to about 14 to 18 oysters of medium size).
25 grammes of pâté de foie gras.

Cheese

Cheese also serves a useful purpose; for taken even in very small quantities it is very filling. Thus Swiss cheese, American cheese, Cheddar and Chester cheese contain about 28 per cent. of albumen, 30 per cent. of fat and 2 per cent. of carbohydrate, and 25 grammes of these cheeses furnish about 100 calories.

Milk

Buttermilk

Milk is a very useful addition to the bill of fare, provided its caloric value and the water it contains are included in the calculation. 100 cc. of milk furnish about 60 calories. This amount can safely be allowed with tea and coffee. Buttermilk is still more useful; for 100 cc. of this beverage only contain from 40 to 45 calories, and a whole quart about 250 calories.

Soups

Thin soups and bouillons and beef tea are exceedingly useful articles, for their caloric value is practically 0. They are very filling, they taste well, and the patient eating a large plate of bouillon imagines that he is getting something of value.

Sauces

Articles made of flour

Rich sauces, as stated above, should be absolutely forbidden, because they are made of large quantities of fat, flour, eggs and their caloric value can hardly be calculated. Articles made of flour or rice, like noodles and macaroni, puddings, etc., should not be allowed at all in the strict reduction cures. In the first and second degrees, however, small quantities may be permitted as a relish. If they are given, each tablespoonful of these articles should be figured as representing about 30 calories.

Potatoes

Potatoes are also permitted, provided they are given in small quantities and are either boiled or baked or mashed and served without butter. One hundred grammes of potatoes prepared in this way contain about 1.5 per cent. of albumen and 18.5 per cent. of carbohydrate, and possess a nutritive value of approximately 80 calories.

Miscellaneous vegetables

Among the vegetables those varieties that grow underground as well as those that grow in pods should be forbidden or restricted, because they contain very large and varying amounts of carbohydrates. If they are permitted at all in the lighter reduction cures their caloric value should be carefully determined. All the other vegetables are exceedingly useful articles of diet in obesity, for they possess a very small caloric value in proportion to their bulk and consequently fill the stomach and rapidly produce a sense of satiety; incidentally they act favorably upon the function of the bowel. They should be served only boiled in salt water, without the addition of cream, butter, flour, etc. If flour or fats are used in preparing vegetable dishes the amounts of these ingredients should be carefully weighed and their caloric value considered.

Preparation of vegetables

Fruit

Fruits of all kinds, with the exception of bananas, sweet grapes, figs, dates, raisins, are permitted without reserve; they, too, are very filling and act well upon the digestive apparatus and constitute a great relish without, at the same time, possessing a high caloric value. About 100 calories are contained in from 220 to 250 grammes of fruit.

Bread

The use of bread is permitted in obesity, only however if the bread is carefully weighed and its caloric value considered. Here the same rules obtain as in the feeding of bread to diabetics, i. e., those varieties that are made of vegetable albumen (gluten breads, aleuronat bread, etc.), are particularly useful if they are baked so as to become fluffy and voluminous, for they, too, are filling without possessing a very large caloric value. I have already shown on page 126 how their caloric value is to be calculated.

Mineral waters

A great many mineral waters enjoy deserved popularity in the treatment of obesity, notably, the waters of Kissingen, Vichy, Homburg, Carlsbad and Marienbad. It is a futile task, however, to attempt the reduction of obesity by the use of these waters alone. It is possible, of course, by producing profuse watery diarrhea with the aid of these waters to cause a considerable loss of water from the tissues and hence a reduction in the weight of the patient. This practice is of some use for psychologic reasons, because the rapid loss of weight in the beginning of the treatment makes a great impression upon the patients and renders them more willing to follow directions later on. The indiscriminate use of mineral waters is, however, to be condemned; for if the diarrhea is allowed to persist too long the effect is without doubt weakening, and this practice, moreover, reacts unfavorably upon the blood pressure and the heart, especially in obesity.

Resort treatment

These patients do very well, as a rule, in resorts in which these waters are taken, but the effects are to be attributed only in a very small part to the drinking of the particular water, and much more to the careful dietetic regulations that are usually carried out in these watering places, and, above all, to the increased muscular exercise that these patients willingly undergo in a resort.

Muscular exercise

This element of muscular exercise is second in importance only to the regulation of the diet in obesity. It can readily be calculated how a definite amount of muscular exercise causes the loss of a definite amount of fat. Oertel, who has studied, more than anybody else, the effect of graduated exercise, especially graduated hill-climbing, upon obesity and the action of the heart, based his original recommendations upon definite calculations.*

Terrain cure in Nauheim

In Nauheim and certain other watering places the Oertel-Terrain cure is given by instructing the patients to slowly climb a series of paths that are elevated at an angle of from 0 to 20 degrees; at the same time, certain other factors are carefully considered (see page 23), as the heart's action improves and the fat is lost, more exercise is allowed each day. In this way it is possible to carefully grade the exercises and remarkably good results are obtained from this practice.

Outdoor sports

Other useful exercises besides walking on a level or hill-climbing, are bicycle riding, rowing and a number of light out-of-door games. Rowing is especially useful, for the amount of exercise can be carefully regulated while, at the same time, full expansion of the lungs with improved oxygenation is promoted. In winter rowing machines fulfill the same useful purpose. Horse-back riding enjoys very good repute as a means of reducing obesity; this reputation, as a German writer states, is deserved as far as the horse is concerned, but not the rider; horse-back riding stimulates the appetite more than any other exercise, without leading to any reduction of the body fat.

Horseback riding

Massage

Massage is of no value whatever in the treatment of obesity. Von Noorden and his pupils have shown by very careful metabolic studies that long continued massage of the whole body exercises no greater influence upon metabolism than opening and shutting one hand energetically a few times.

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*Assuming that a man weighing 60 kilogrammes ascends an elevation each day of 100 meters, then the labor performed is equal to 60x 100=6,000 kilogrammeters; as a matter of fact, much more energy is expended, for the external labor produced represents only about 30 per cent of the total energy developed; thus such an individual in a day develops fully 20,000 kilogrammeters of energy. As 425 kilogrammeters of muscle work require 1 calorie, 20,000 kilogrammeters require 47.06 calories, and this amount of caloric value is furnished by 47.06÷9.3= 5.06 of fat. It will be seen, therefore, that such an individual must consume 5.06 of body fat to raise his body 100 meters. It is immaterial, of course, according to the laws of the conservation of energy, whether or not this elevation is reached within a short time or within a long time, by a vertical path or by a long series of inclined paths.

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by the restriction of water drinking or by sweating without, at the same time, doing the patient any harm. For the dose and administration of thyroid gland preparations see index.

III. RHEUMATISM.

Nomenclature and definition

The term rheumatism is a remnant of an ancient nomenclature and is loosely employed to designate a great number of morbid conditions, many of them related in no way to one another. Used originally by the humoral pathologists to indicate the circulation of disordered humors, it was later applied to a variety of fleeting pains in many parts of the body, i. e., to a symptom As such pains were commonly produced by exposure to cold and dampness, many disorders that followed such exposure were called rheumatic, so that the term was used in an etiologic sense. As the joints were commonly affected in these disorders, the term rheumatism was later loosely used to indicate joint affections in general. Finally, a "rheumatic diathesis" was constructed in which there was said to be a special predisposition to articular involvement ("Arthritism" of the French).

From the clinical standpoint, and also from the standpoint of etiology, it becomes necessary to exclude as not belonging at all to rheumatism:

Rheumatic fever

First. Acute articular rheumatism, or rheumatic fever, a disease that is without doubt infectious in character. This disorder will be discussed in the Chapter on *Infectious Diseases.*

Pseudo-rheumatism

Second. A variety of articular inflammations that are grouped under the unfortunate name of pseudo-rheumatism, that are of parasitic origin and due to infection of the joints with certain bacteria, or to inflammation of the joint membranes by their toxins. To this group belong gonorrheal, pneumococcus, diphtheritic, influenza, staphylococcus and tuberculous arthritis, also the joint lesions seen in scarlatina and measles. These, too, will be mentioned in the sections on the different diseases that produce them.

Rheumatic gout

Third. The acute articular lesions of gout. These are often confounded with rheumatic lesions but are not related to them. Hence they will be discussed separately in the Chapter on *Gout* and the *Uric Acid Diathesis.*

In fact "the words 'rheumatism' and 'rheumatic' are often so loosely employed that they have almost forfeited all claim to be regarded as scientific terms." (A. E. Garrod.) Consequently I do not feel justified in discussing under the title of rheumatism the great array of symptoms involving almost every organ of the body, chiefly the nervous system, the peri- and endocardium, the pharynx, the tonsils, the eye, the skin and the perios-

Muscular rheumatism

teum that have been included under this term, but prefer to discuss the "rheumatic" inflammations affecting these different tissues in the Sections devoted to the diseases of the various organs involved. On account of the great frequency and clinical importance of rheumatic myalgia, and on account of the popularity of the term "muscular rheumatism" employed to designate this disorder, a special chapter may, however, for practical reasons be given to the treatment of this affection.

Chronic rheumatism

There remain to be discussed separately a number of varieties of "chronic rheumatism." Some of them are consecutive to acute articular lesions, others have an insidious onset and run a chronic, usually progressive course. They all have a tendency to involve several joints, with their tendons and muscle sheaths at once, and to appear symmetrically, although some mono-articular forms are known (malum coxæ senilis and pseudo-arthritis vertebralis). In all of them are found anatomic changes about the fibrous tissues and synovial membranes, the cartilages of the joints, with osteophyte formation and osseous atrophy. To be excluded from these forms, from the standpoint of anatomic classification, are those varieties in which urate deposits are present, i. e., that are manifestly due to the uratic diathesis; also the syphilitic joint lesions and those forms that are due to some primary disorders of the spinal cord (spinal arthropathies); finally, those forms that are due to chronic suppuration.

However interesting and important it may be with respect to the etiology, pathological anatomy and diagnosis, to differentiate between these manifold forms of chronic rheumatism, from *therapeutic* considerations it is unnecessary; for the treatment of all these varieties, notwithstanding their origin and immaterial whether the disease involves the joints, the tendons or the muscle sheaths, singly or together, is practically the same. Inasmuch as, on the one hand, the same term is often used to designate different disorders, and, as on the other hand, many terms are employed by different writers synonymously, to designate the same lesions,[1] I will not undertake in this volume[2]

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(1) The most common and the most popular terms employed to designate this large and heterogenous group of morbid entities are arthritis or pseudo-arthritis deformans, rheumatoid arthritis and chronic articular rheumatism. The following terms, however, are all used to designate chronic progressive "rheumatism" of different joints not due to acute infections (pseudo-rheumatism and rheumatic fever).

Goutte Asthénique Primitive (Landré Beauvais, 1800).
Digitorum Nodi (Heberden, 1804).
Nodosity of the Joints (Haygarth, 1805).
Chronic Rheumatism of the Joints (Todd, 1843).
Arthrite sèche (Deville und Broca, 1848 und 1850).
Rheumatisme Chronique Primitif (Charcot u. Vidal, 1853 u. 1855).

to bring order out of this chaos, especially as any classification, however refined and accurate it might be, would in no way render us more successful in the treatment of chronic rheumatism.

It is my intention, therefore, in the following pages, under the heading of *"Chronic Rheumatism,"* to discuss together the treatment of chronic articular, tendinous and muscular lesions that are either consecutive to any of the acute forms of arthritis, or that are due to trophic changes (spinal lesions), or that are of unknown etiology and run a chronic course. I am fully aware of the fact that this procedure must appear inexact, but I see myself regretfully forced into this necessity by reasons of practical expediency, otherwise endless reiteration would be necessary. We can only hope that before long more light may be thrown into this obscure region.

MUSCULAR RHEUMATISM.

Definition

Muscular rheumatism or myalgia (lumbago, pleurodynia, torticollis, etc.) is in all probability a neuralgia of the sensory nerves of the muscles involved and not an affection of the proper muscle structures. The term rheumatism, as explained in previous paragraphs, is a misnomer. Uric acid has nothing whatsoever to do with so-called muscular rheumatism, popular prejudices to this effect to the contrary notwithstanding. In view of our ignorance of the real nature of myalgia and of its exact causes, treatment can, of necessity, be only symptomatic.

Protection against cold and wet

As the disorder generally follows exposure to wet and cold the same rules in regard to clothing and the general hygiene of the patient should be observed that are mentioned in detail under *Rhinitis* and *Anemia.*

Abortion of the attack

An attack of muscular rheumatism can occasionally be aborted. Upon the appearance of the pain the patient should take

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Usure des Cartilages Articulaires (Cruveillier, 1858).
Chronic Rheumatic Arthritis (Adams, 1857).
Rheumatisme Noueux (Trousseau, 1860).
Arthritis deformans (Virchow, 1869).
Rheumatoid Arthritis (Sir A. Garrod, 1876).
Osteoarthritis (Spencer, 1888).
Pernicious Arthritis (Brabazon, 1896).
Rheumatisme chronique infectieux (Chauffard und Ramon, 1896).
Rh. chr. infectieux et diathésique (Pierre Marie).
Rhumat. chr. progressif (Charcot, Le Gendre).
Polyarthritis villosa und Arthritis deform. (Schueller).
Arthritis nodosa (Schuchardt).
Osteoarthritis deformans (Schuchardt).
Rhum. chr. deformant (Teissier und Roque). [Pribram.]

(2) *For a detailed discussion of this part of the subject, see my forthcoming book on *"Diseases of Metabolism."*

a Turkish bath, or a hot bath of 100° to 105° F., followed by a sweat between woolen blankets; internally ten grains of Dover's powder, or five grains of quinine with five grains of salol. Free catharsis should be promoted by a tablespoonful of magnesium sulphate.

Anodynes and anti-neuralgics

Salicylates Alkalies

If these measures fail to abort the attack, then treatment with anodynes and anti-neuralgics should be instituted. This therapy is based on the following principles: Patients with muscular rheumatism have a tendency to voluntarily immobilize the affected muscles; they do this in order to stop the pain. The arrest of the movement of the muscles undoubtedly retards the healing of the attack, for reasons that we do not understand. To discuss the numerous theories that have been advanced to explain this phenomenon would serve no practical purpose. So much we know that active movements of rheumatic muscles hasten recovery. Hence it is good practice to artificially stop the pain by the administration of medicines by mouth or by local applications, for then the patients are enabled freely to move their muscles and in this way to promote restitution to normal conditions.* Internally, therefore, opiates, phenacetin, acetanilid, preferably combined with salicylates and alkalies, should be administered either singly or in combination. The following prescriptions I have found very useful:

℞

Codeine,	¼ gr. (0.016 gm.)
Phenacetin,	3 gr. (0.18 gm.)
Salol,	5 gr. (0.3 gm.)
M.	

or

℞

Extract of opium,	¼ gr. (0.016 gm.)
Acetanilid,	3 gr. (0.18 gm.)
Sodium salicylate,	
Sodium bicarbonate,	āā 5 grs. (0.3 gm.)
M.	

S. One such powder to be taken every four hours with a full glass of water.

If these remedies do not stop the pain, then it may become necessary to use morphine hypodermically, in quarter-grain doses repeated two or three times a day, and preferably injected into the sore muscles; if the drug is administered in this way both the narcotic effect of the remedy and the mechanical effects of the puncture are utilized; for puncture alone of the affected muscles with a long sterile needle often acts marvelously in stopping the pain and in a sense in aborting the attack.

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*In the case of the intercostal group of muscles, however, that cannot be kept quiet at the patient's will, it may become necessary, provided these remedies do not stop the pain, to artificially immobilize the affected area, in order to afford temporary relief, by strapping the chest with broad layers of adhesive plaster.

Acupuncture

In case of rheumatism of large muscles, and particularly in lumbago, acupuncture should be performed in the beginning of the attack, as a routine measure, by inserting an ordinary sterilized hat pin for four or five inches into the affected muscle and leaving it in place for from five to ten minutes.

Local applications

In addition to internal remedies heat is useful, applied by means of hot water bags or a thermophore (see page 39), or by poultices made of flaxseed or bread, medicated with a few drops of the tincture of opium or tincture of belladonna. High degrees of heat applied by means of hot air and sand, as described in the next section (see page 171) are exceedingly useful, especially in rheumatism of the muscles of the legs and arms. Mustard, belladonna or capsicum plasters may be used locally over the affected area. Iodine may be painted over the sore muscles. Such measures as cupping, blistering or cauterization of the skin over the rheumatic area are rarely necessary. Liniments, as chloroform liniment, or the following application, are also sometimes effective in relieving the pain:

℞

Tincture of aconite,	
Tincture of opium, of each,	2 drachms (4)
Soap liniment,	3 ounces (96)

M.

Diet

I have never been convinced that particular dietetic regulations or restrictions exercise any determinable effect upon the course of muscular rheumatism, nor that the abundant drinking of plain water, or of any of the numerous medicated mineral waters, in any way shortens the attack or prevents the recurrence of muscular rheumatism. However important, therefore, the regulation of food and drink may be in gouty forms of musculo-articular affections, in simple so called muscular rheumatism the patient need not be unnecessarily burdened with dietetic restrictions.

Electricity
Massage

The constant galvanic current, by causing contractions of the affected muscles, and massage by mechanically moving the muscles about, are useful adjuvants to the treatment.

CHRONIC RHEUMATISM AND RHEUMATOID ARTHRITIS.*

Prophylaxis

In this disorder prophylactic treatment is occasionally effective in preventing the development of irremedial disorders about the joints. It seems well established that most of the cases develop in individuals whose vitality is low, consequently it is of paramount importance to counteract all extraneous influences that can reduce their vital powers. If an individual, therefore, who comes from a rheumatic family, begins to complain of fleeting pains in muscles, tendons and joints, and transitory stiffness of the fingers or the knees, his mode of life should be carefully regulated.

Dwelling and general hygiene

Among the most important elements to be considered are the dwelling, the clothing and a variety of psychic factors. The patient should be instructed to seek a domicile that is dry, well-ventilated and light, for moisture and lack of sunlight undoubtedly predispose to the development of the disease under discussion. Living in a gloomy dwelling, moreover, exercises a depressing psychic influence, and this, as well as any other emotional strain or worry, should be most carefully avoided. The patients should, above all, be protected against exposure to wet weather or sudden temperature changes; consequently, it is often important to induce individuals whose occupation forces them to undergo such exposures to change their mode of livelihood.

Clothing

The clothing is, of course, of great importance. Many of these people are anemic and react badly to temperature changes. Linen or cotton should never be worn close to the body; for these textures favor rapid radiation of heat, become wet and cling to the body when the patient perspires and hence obliterate the layer of immovable air that should intervene between the skin and the first garment. Wool or flannel, or silk, are best of all for reasons that have been fully set forth under the head of *Anemia*. If the individual is strong enough it is always well to attempt to harden him (see *Rhinitis*), i. e., to render him less susceptible to temperature changes.

Diet

The diet should be especially nourishing without overloading the stomach. The error is frequently committed of feeding these individuals according to the principles that are outlined under the *Uric Acid Diathesis*. This is always dangerous; for underfeeding, with its inevitable result malnutrition is very apt to follow from this practice. It is useful, there-

on see page 161.

fore, to appreciate that the uric acid diathesis, so-called, has nothing whatsoever to do with chronic rheumatism.

Water drinking

The patient should be instructed to drink plenty of water, preferably some alkaline mineral water that possesses slightly laxative properties. This plan is always indicated, for, in many of the cases the alkalinity of the blood is slightly reduced.

Treatment of catarrhal conditions about the orifices of the body

The infectious character of some varieties of chronic rheumatism cannot be denied, consequently great care should be exercised in removing catarrhal conditions about the orifices of the body, for they undoubtedly constitute an open port of entry for any micro-organisms that might be incriminated with producing the disorder. Inasmuch as women seem to be particularly liable to chronic rheumatism, special care should be bestowed upon diseased conditions in the female sexual apparatus.

Treatment of acute exacerbations

The disease occasionally starts in with more or less acute arthritic manifestations, or acute manifestations appear as exacerbations during the chronic course of the disease. Whenever the joints are acutely affected the patients should be put to bed on a restricted diet consisting largely of milk, alkaline waters and some fresh fruits or vegetables, and the joints should be immobilized. Great care, however, should be exercised not to immobilize the joints too completely or for too long a time; for otherwise, irremediable adhesions and ankylosis may form. The chief object of the temporary immobilization is to reduce the pain by preventing contact and friction between the inflamed, opposing structures within the joints. Permanent extension has also been recommended. It acts beneficially by causing relaxation of the muscles and tendons, thus separating the condyles and again preventing friction and pressure upon the joint cartilages.

Immobilization of the joints

Extension

Moist dressing

In order to reduce the swelling and stop the pain linen bandages dipped in salt water may be applied. The bandages need not be changed every day but may remain in place for three or four days in succession, provided they are kept moist during all this time. The application of bandages moistened with 2 per cent. carbolic acid was formerly very popular, but a number of cases of gangrene from this source have been reported, so that this practice must be considered dangerous. A 20 per cent. alcoholic solution of salicylic acid with a few drops of chloroform occasionally aids greatly in relieving the pain. Very good formulæ for local applications of this kind are the following:

Local applications

℞

Salicylic acid,	10 gm.
Alcohol,	50 cc.
Castor oil,	100 cc.

M.

A teaspoonful of this mixture is rubbed into the joint and the member then covered with silk or rubber and wrapped in cotton or flannel.

Or an ointment may be applied, consisting of:

℞

Salicylic acid,	10 gm.
Oil of terebinth,	10 cc.
Lanolin,	30 gm.
Paraffin,	50 gm.

M.

Or a medicated collodion may be painted upon the joint, prepared as follows:

℞

Methyl salicylate,	10 cc.
Spirits of menthol,	5 cc.
Elastic collodion,	5 cc.

M.

One of the most popular preparations, finally, is guaiacol mixed with equal parts of glycerin, or with the tincture of iodine, in the proportion of one part of guaiacol to six parts of the tincture of iodine.

Injections into the joint

Injections into the joint of iodoform emulsions of guaiacol have also been used; the formula recommended being:

℞

Iodoform powder,	5 gm.
Glycerin,	60 to 100 cc.
Guaiacol,	20 drops

M.

Ointments

In case the pain about the joints is very violent, then opium or belladonna ointments or chloroform liniments must be applied, or hypodermics of morphine must even be administered. Counter-irritation with iodine frequently relieves. If there is very much swelling, then paracentesis of the joint, followed by the injection of the above iodoform-guaiacol preparation may be practised.

Internal medication
Guaiacol
Beta-Naphthol
Salicylates
Salol
Asperin
Alkaline-quinine treatment

For internal use innumerable remedies have been recommended, but none of them has fully vindicated the claims to real efficacy in this disease. Guaiacol preparations should always be tried. The carbonate of guaiacol is better than pure guaiacol as it is less irritating to the stomach and kidneys. The carbonate should be given in doses of five to fifteen grains (0.3 to 1 gm.) three or four times a day. Next in popularity to guaiacol carbonate is beta-naphthol. Salicylic acid preparations are of subordinate value in the treatment of chronic rheumatism. In view of the difficulty, however, of distinguishing clinically between the various forms of sub-acute rheumatism, it is often worth while to give salicylate preparations, either in the form of salol five to ten grains (0.03 to 0.65 gm.) three or four times a day, or as aspirin in the same doses. The so-called alkaline-quinine treatment, that is, the combination of quinine two to five grains (0.1 to 0.3 gm.) and sodium carbonate five to ten grains (0.3 to 0.6 gm.) may also be employed, if all other measures fail, for occasionally good results are seen from this medication.

Treatment of fully developed stage

As soon as the acute and sub-acute stages are over, or if the case comes under observation for the first time with a fully developed case of chronic rheumatism, then treatment should be directed almost exclusively towards promoting absorption of the exudates that may be present, towards preventing the formation of ankylosis and contractures, or towards loosening the ankylosis and relieving the contractures if they have already formed.

Subordinate importance of drugs
Value of external applications

In order to fulfill these objects dietetic and medicamentous measures are of very subordinate importance. What remedies are given should be administered as general tonics, or in order to correct any anemia that may be present, or, symptomatically, to relieve pain or other disagreeable local symptoms; thus strychnine, quinine, iron, arsenic and occasionally guaiacol carbonate, salol, beta-naphthol, and the other remedies that have been enumerated above when discussing the drug treatment of the acute and sub-acute arthritic manifestations of chronic rheumatism, may all be utilized. The chief reliance, however, should be placed upon external measures. Neither diet nor drugs can accomplish much in this disease. Local external treatment can accomplish everything that one can reasonably expect to see brought about.

Heat

Heat in various forms must be applied to the affected joints. Hot baths, plain or medicated, mud baths, sand baths, steam baths, sun baths, hot air baths, may all be used. All of these baths act by accelerating the circulation of lymph and blood in the diseased joints, and hence promoting absorption of liquid, semi-solid or solid exudates that may have formed.

The temperature of the bath and the length of time during which the hot applications are to be made vary in each individual case and no fixed rules can be formulated. One cardinal rule should always be observed, however, viz., that, in the beginning of the treatment, very high temperature should never be employed. If the individual is suffering from nervous disorders or from disturbances about the circulatory apparatus, then any bath treatment should be begun with great care and under careful supervision of the nervous reaction, the blood pressure and the condition of the heart and arteries.

Resort and institution treatment

Inasmuch as the bath treatment must be carried out consistently for long periods of time, sometimes for months, before very appreciable effects become noticeable, and as proper facilities for this treatment are only with difficulty procured at home, it is usually necessary to have such patients undergo their bath cure in certain watering places or institutions that are especially equipped for these treatments. The number of these resorts is legion and in selecting an institution or a watering place one should be governed by the circumstances of the patient, the time at his disposal, and many other extraneous factors that need not be enumerated. The chemical composition of the water at different resorts has very little to do with the good effects of these waters, nor is there anything to indicate that the addition of various medicinal substances as pine needles, turpentine, carbonate of soda or potash, sulphid of potassium, arsenate of soda, formic acid, etc., to the bath water exercises any specific effect upon the disease process that could not be obtained by the use of plain hot water. The addition of salt and other slightly irritating ingredients to the water may enforce the action of the heat, inasmuch as they produce increased hyperemia of the skin and hence more active and prolonged dilatation of the superficial capillaries, with a correspondingly increased blood and lymph flow through the underlying joint structures. The slight advantage accruing from this effect is almost negligible, however, so that the extravagant claims advanced by the promoters of different resorts and waters in this country and abroad, in regard to the wonderful efficacy of their particular spring in curing chronic rheumatism, may be dismissed without further comment. It all depends upon the régime at these different places, the facilities for securing proper massage and the method of applying the hot water, but not upon the chemistry of the waters used.

Extravagant claims of promoters of resorts and waters

Mud baths

A very convenient method of applying high degrees of temperature to the affected joints is by the aid of mud baths, for the mud particles irritate the skin and also exercise pressure upon the affected joint, in both these ways enforcing the action of the heat and promoting more rapid absorption of the pathologic exudates. Here, again, it is the heat and the physical properties of the mud and not the chemical constituents it may contain that exercise the good effects.

Sand baths

For domestic application sand baths are exceedingly useful, for very high temperature can be applied with the aid of sand. The hot sand (up to 150° F.) may be filled into little linen sacks and applied to the joints; in this way the benefits of both pressure and heat are obtained. The length of time during which the application is made varies according to the sensations of the patient. If the finger joints alone are involved it is a very useful plan to have the patient put on a cotton glove and immerse his hand in the sand, holding it there for fifteen minutes to an hour at a time, several times a day.

Hot air

The most effective way of applying heat, and the one that permits the use of the highest temperature, is by means of hot air. Special apparatus of different makes are on the market which enable the patients to carry out this treatment at home. Temperature as high as 300 to even 400 degrees F. can be borne without discomfort. Dry heat used in such an apparatus makes it possible to treat one joint at a time while the rest of the body is protected from the heat; this prevents disagreeable and dangerous phenomena about the nervous and circulatory apparatus.

Sun baths
Electric baths

Sun baths and electric light baths are also employed in certain institutions and occasionally fulfill a useful purpose. Here, again, the heat is the active agent and not, as far as we know, the chemical rays of the light.

Douches

In some institutions the mechanical effect produced by a stream of hot water directed against the joints is utilized to advantage to promote the circulation in the joint and to enforce the effect of the heat. One of the best plans is the so-called "Scotch douche." Here the temperature of the stream of water which is directed against the affected joint with considerable force is rapidly changed from hot to cold and back again, and a very marked effect is generally produced in this way.

Bier's method of passive hyperemia

A method that has recently come into deserved popularity is the production of passive hyperemia in the affected joint. This is the so-called Bier method. In order to produce passive hyperemia a bandage is wrapped around the limb above the joint. It is applied so tightly that the region about the joint becomes bluish-red in color and swollen. The application of the bandage should never produce pain in the affected articulations. Occasionally a little throbbing is complained of in the beginning, but even this disagreeable sensation should disappear within a short time. The constriction should at first be continued for several hours at a time, later for all day; still later, the bandage is applied only during the night. No harm has ever been known to follow this method of treatment and some of the results reported are exceedingly satisfactory, so that it certainly deserves extended trial.

Massage and movements

The application of heat by any of the means mentioned above can usually be supplemented to advantage by proper massage and by active and passive movements of the affected joints. Here, too, the improvement of the circulation that follows the massage aids in the absorption of the pathologic exudates. Inasmuch as this treatment should be performed by a skilled operator it is needless to discuss the technique of massage.

Electricity

Electricity has been used in many cases of chronic rheumatism with good results, either alone or combined with heat and mechanical treatment. The electric current undoubtedly exercises a distinct effect upon the circulation in the skin and the underlying parts, and may, in this way, aid in promoting a more rapid flow of lymph and blood through the affected area. This method of treatment, too, should be carried out by an expert, otherwise it is usually futile. The faradic brush and the solenoid current are particularly recommended. Recently good results have also been reported from high frequency currents, but this question is still in abeyance.

Orthopedic and surgical treatment

Reduction of obesity

In the later stages of the disease when ankylosis and deformities have occurred, orthopedic and surgical treatment often becomes necessary. In this connection the importance of reducing obesity in sufferers from chronic rheumatism of the joints may again be referred to (see page 150); for the reduction of the weight of the person of necessity relieves the joints of much pressure and saves them the labor of supporting a huge bulk; hence a reduction cure acts in the same sense as the mechanical supports that are given these patients by orthopedic surgeons. The various surgical procedures that have to be instituted in deformed cases cannot be discussed within the compass of this book.

IV. GOUT AND THE URIC ACID DIATHESIS.*

Introductory—The principles underlying the treatment of the uric acid diathesis
The neurosal element

Of the primary causes of the uric acid diathesis we know nothing. Theoretically, I place myself without equivocation upon the neuro-humoral viewpoint so ably defined by Duckworth in the following words: "It is incumbent, I believe, to invoke not only a chemical and a physical basis for gouty disease, but to include also in a comprehensive review the marked determining influence of the nervous factor in the problem."

The neurosal element is vague and intangible, essentially hereditary and probably not remedial in one generation. The perversions of the uric acid chemism on the other hand are more definite and are amenable to considerable modification and to correction by treatment.

There is immense confusion in this field. This may be due to the fact that the course of typical gout is *per se* irregular and subject to fluctuations, and that atypical gout* presents so protean a syndrome of functional disorders, involving almost every organ, that the doors are thown wide open to subjective misinterpretation.

In seeking for a basis of treatment the fundamental perversions characteristic of the uric acid diathesis must be determined. They are the following:

1. The uric acid of the blood is increased.
2. Crystalline deposits of sodium urate are found in certain necrotic tissues.

The increase of uric acid in the blood

The former factor alone, however, by no means constitutes the essential element of the so-called uric acid diathesis, for in several diseases, notably leukemia, the circulating and excrementitious uric acid may be increased immensely without ever producing any of the symptoms or lesions of gout or goutiness. It is safe, on the other hand, never to include a case under the category of the uric acid diathesis unless the uric acid of the blood is increased.

The increase of uric acid in the blood may be due to: (1) Increased formation of uric acid. (2) Decreased destruction of uric acid. (3) Retention of uric acid; or to several of these factors combined.

Uric acid derived from nuclein

The analytical formation of uric acid, i. e., the genesis of uric acid from the disassimilation of more complex compounds, is the common mode of formation in man. The old view is that uric acid is an oxidation product of albumin and an inter-

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*Synonyms: Lithemia; Urichemia; Atypical, irregular, incomplete or abarticular Gout.

Blood alkalinity

Much has been written in regard to the influence of reduced alkalinity of the blood. It does not appear, however, from exact determinations that the alkalinity of the blood is abnormally low in the uric acid diathesis.

Proportion of salts

A much more important factor are changes in the relative proportion of salts (chiefly mono- and di-sodium phosphate) in solution in the serum. If several salts are present in solution the more soluble salt will precipitate the less soluble one even if the solution is not saturated with the latter. Given, therefore, an increase of urates in the blood, with local stasis of blood and lymph, then a slow interchange between two relatively concentrated solutions occurs, and precipitation of the least soluble salts, the urates, obtains.

Senile cartilages are relatively rich in salts, and the circulation in these tissues is particularly poor; hence possibly the tendency of older subjects to uratic deposits in the joints.

Necrosis in the vicinity of urate concretions

The significance of the necrosis found in the vicinity of urate concretions is still obscure. Either the urates produce the necrosis or the necrosis is the primary event and prepares a suitable nidus for the secondary deposit of urates; the cause of the necrosis in the latter event would remain unexplained; it may be tropho-neurotic or may be due to the action of the alloxuric bases, chemical congeners of uric acid.

General considerations relative to treatment based on the above principles

As the primary cause of the uric acid diathesis is unknown and as the neurosal element that enters into its pathogenesis is intangible, we are limited in our treatment to a correction of the perversions of the uric acid economy that we have outlined above.

We find ourselves here in a similar position as in the treatment of diabetes and obesity, for in these diseases, too, we are limited in our endeavors to the removal of excessive sugar and fat and to a correction of the secondary disorders that follow the abnormal accumulation of these products. Unfortunately, we have in the uric acid diathesis no such definite index of the progress of the disease and the success of our treatment, as the disappearance of sugar from the urine or changes in the contour of the patient. The two chief indications for treatment are:

Chief indications for treatment

1. To prevent the increase of uric acid in the blood; this accomplished the precipitation of urates as we have seen is rendered difficult.

2. To promote the solubility of uric acid in the blood; in this way its precipitation may also be prevented.

As the accumulation of uric acid may be due to increased formation, decreased destruction, or retention, treatment should be directed towards reducing the production of uric acid, increasing its destruction, and accelerating its elimination.

Limited use of uric acid-forming foods

To reduce the production of uric acid is one of the most important, and at the same time one of the most feasible, tasks of dietetic treatment. We know that the uric acid is chiefly formed from disintegrating cell nuclei and that the restriction of articles of food containing many cell nuclei or nuclein or uric acid, or its chemical congeners, the alloxuric bases (purin bodies), must needs decrease the formation of uric acid. And even should it be shown that the accumulation of uric acid is due to retention or non-destruction, and not to over-production, the limited use of uric acid-forming foods must nevertheless be considered altogether rational.

The destruction of uric acid

We know too little of the normal mechanism of uric acid destruction to enable us satisfactorily to regulate this process. What means we possess to accomplish this end are not dietetic. The withdrawal of articles of food that are more readily oxidized in the body than uric acid was at one time considered to be good practice, for it was argued that in this way the oxidizing powers of the organism would not be directed toward a destruction of these articles, but to the destruction of accumulating uric acid instead. Since it has been shown, however, that uric acid is not destroyed by a proper process of combustion, but by a more delicate process of intracellular disassimilation (probably fermentative in character), this argument has been rendered altogether invalid.

Elimination of uric acid

Certain dietetic regulations can finally directly and indirectly aid in the elmination of uric acid; directly, by exercising an effect on the circulation and the renal excretion; indirectly, by sparing the heart and kidneys and enabling them to perform their functions in a normal manner. As the latter organs are frequently involved in the uric acid diathesis, it is particularly important that the diet should contain nothing that can injure them.

The diet

The following considerations, therefore, based on the principles just predicated should govern the selection of the diet in the uric acid diathesis.

Meat

There is much disagreement and misunderstanding in regard to the use of meat. One group of extremists interdicts the use of meats altogether; another makes artificial distinction between dark and red meats; and a third insists on a diet consisting almost exclusively of red meat ("Salisbury diet"). In this country the red and dark meat fad is particularly rampant. I see the matter as follows: The use of a moderate amount of

"Salisbury" diet

Blood alkalinity

[illegible] Some care must [illegible] and in determining [illegible]

Proportion [illegible] salts

[illegible] extractives (uric acid and [illegible] hence all meats containing [illegible] organs (liver, kidneys, sweet-[illegible] be rigorously excluded. All [illegible] gravies contain the extractives [illegible] meats, smoked and cured meats, [illegible] contain the extractives, should [illegible]

[illegible] because birds produce more [illegible] on the erroneous conclusion [illegible] are also particularly rich in [illegible] to exclude poultry.

Necrosis [illegible] the [illegible] urate con-cretions

[illegible] exact analyses that there is no [illegible] acid content between the dark [illegible] This distinction is therefore also [illegible]

[illegible] roast or fried meat, because the [illegible] from the former. Some writers [illegible] of extractives introduced with [illegible] cannot possibly exercise an appre-[illegible] however, some evidence to show that these [illegible] small quantities for a long time, may [illegible] effect. It is safer, therefore, to adhere [illegible] until evidence to the contrary is forth-[illegible]

Gen[illegible]

[illegible] of course, to directly control the nuclein [illegible] organism proper by restricting the use of nu-[illegible] is capable of building up its tissue-nucleins [illegible] and phosphorus-containing pabulum. We [illegible] that whole peoples live on a vegetable diet [illegible] (these by the way are remarkably free from [illegible]

[illegible] of the meat exercises no direct effect on the [illegible] acid and may therefore be considered an essen-[illegible] constituent of flesh as far as the uric acid [illegible] concerned. The quantity of meat should, however, [illegible] although not reduced too much. The organism re-[illegible] quantity of nitrogenous material, and while [illegible] to supply all the nitrogen required in articles of [illegible] than meat, this procedure necessitates feeding the [illegible] large quantities of bulky material leaving much [illegible] taxing the digestive apparatus very severely. It is more natural and more rational to supply a portion of the nitrogen in meat, especially as the withdrawal of meat constitutes a great hardship to many patients and it would be unnecessarily cruel to stop its use. One pound of meat, moreover, contains as much nitrogen as several pounds of most other nitrogenous articles of food.

Unless the caloric value of the diet is carefully calculated there is always danger of under-feeding the patients when meat is withdrawn. This is a dangerous possibility, for it favors the development of gouty cachexia, lowers the tone, and therewith reduces the activity of the oxygenation powers of the body. If nitrogen is deficient the organism, moreover, compensates for this deficiency by increasing catabolism of its own (nuclein-containing) tissues.

Dangers of too much meat

On the other hand, too much meat is certainly bad, for, in the first place, meat produces a distinct digestion leucocytosis, followed by the disintegration of leucocytic nuclei; in the second place, meat reduces the alkalinity of the blood owing to the sulphur and phosphorus it contains, for these elements, as we have seen, are oxidized to sulphuric and phosphoric acids, and as the bases (potassium, sodium, calcium, and magnesium) liberated from the meat at the same time are incapable of completely neutralizing these acids, acidulation of the bodily fluids occurs (corned beef is particularly bad in this respect because all the basic salts are leached out in its manufacture and replaced by neutral sodium chloride); in the third place, meat taxes the eliminatory powers of the kidneys very much and these organs must be spared and protected in the uric acid diathesis.

Eggs

Eggs in moderation may be permitted. True, the yolk of egg contains abundant nuclein (vitellin), but this nuclein is different chemically from the nucleins of meat and cannot split off uric acid. Nevertheless, I restrict the use of yolk of egg. The white of the egg exercises no effect on the uric acid excretion even when given in large quantities; of course, it, too, like meat albumin, can reduce the blood alkalinity. Where it is well borne, it is, however, a very convenient form in which to supply nitrogen.

Milk

An exclusive milk diet, as advised by some, is always bad, particularly in old people; for the ingestion of large quantities of water incident to abundant milk drinking must needs overtax the heart, the arteries, and the kidneys (see page 208 f). Milk as an addition to a mixed diet is good if it can be borne; here we must individualize. The nucleins it contains are paranucleins and do not produce uric acid. Milk slightly reduces the alkalinity of the blood, owing possibly to the generation of lactic acid and to the oxidation of its proteids.

All these theoretical disadvantages are, however, overcompensated by its highly nutritious character and its powers to stimulate diuresis.

Cheese In the manufacture of cheese the basic alkali salts contained in the milk are dissolved in the whey; hence cheese is poor in these salts. The same objections can therefore be formulated against its use as against corned beef (see above), viz., that it acidulates the blood owing to the formation and incomplete neutralization of sulphuric and phosphoric acids; in addition, the free fatty acids that cheese contains may enforce this effect. As a matter of fact the urinary acidity increases after a cheese diet. Empirically, cheese has been known to precipitate gouty attacks, and in certain regions of Germany where much cheese is eaten urinary calculi are said to be very frequent. I consequently usually exclude cheese from the dietary, although there is no compelling scientific reason for doing so.

Fats It has been argued that fat should be omitted from the diet in uratic cases because it is so readily oxidized and hence prevents the oxidation of the nucleins. Withdrawal of fat does not, however, exercise any effect on nuclein catabolism nor on uric acid excretion. Excessive feeding with fat has, on the other hand, been known to cause an increased excretion of uric acid.

Paradoxical as it may sound, fat is particularly indicated in those cases that are inclined to obesity; for if fat is added to the diet, the appetite is more rapidly appeased, the patients consequently do not eat so much, and are above all not so apt to gormandize.

As uric acid patients should be instructed to take much physical exercise, the addition of some fat to the diet is almost indispensable to maintain full nutrition.

If, therefore, certain individual idiosyncrasies, and also the state of the digestive apparatus, are duly considered, there is no valid objection to the use of fat in moderation.

Carbohydrates Carbohydrates exercise no appreciable effect on the uric acid excretion nor do they irritate the kidneys. They do, however, favor the development of dyspeptic disorders, because they readily undergo fermentation and because they are so bulky.

As all carbohydrates are quite soluble and are easily absorbed patients living on a carbohydrate diet are very apt to ingest too much nutrient. Many persons, for instance, could without difficulty master 1,000 grammes of carbohydrate in the form of bread, cake, potato, etc., a day, whereas no one would be tempted to eat an equivalent quantity of fat (440 grammes) or of albuminous food (1,000 grammes).

Carbohydrates, moreover, favor alimentary glycosuria and, indirectly, the development of diabetes and obesity, both complications that are not infrequently seen together with the uric acid diathesis.

Carbohydrates should therefore be restricted. In cases complicated with diabetes or obesity they should be temporarily forbidden altogether or replaced by fat. In patients suffering from dyspeptic complications, or in persons inclined to over-eat, their use should also be restricted.

Fruits and vegetables

Certain of the bulbous vegetables, viz., potatoes, cabbage, etc., contain a very large percentage of carbohydrate and very little proteid; as they, therefore, possess all the disadvantages of carbohydrate foods, and only very slight nutritive value in proportion to their bulk, they should be used sparingly in the uric acid diathesis. They are also apt to undergo fermentation and to produce dyspeptic disorders.

Salads and all green vegetables, on the other hand (with the exception of young germinating plants, such as asparagus, that contain much nuclein), may be given freely. They contain relatively little carbohydrate and a large proportion of salts. The large residue of cellulose they leave in the digestive tracts stimulates peristalsis and aids in keeping the bowels open; this is a desideratum in gouty cases. Celery and onions are to be forbidden on account of the irritating oils they contain.

Spices and condiments

All spices and condiments should be avoided; they irritate the digestive tract and the kidneys and above all stimulate the appetite and in this way encourage over-eating.

All fruits, either deciduous or citrous, may be permitted. The acid salts they contain are converted into carbonates and render the urine alkaline; they contain very little carbohydrate. Empirically, too, we know that they act beneficially in the uric acid diathesis (so-called "fruit cures"). Fruit acids exercise no distinct effect on the excretion of uric acid, with the exception of tannic acid which seems to decrease it.

Fruit cures

Water

Water should be the chief beverage. Forced water-drinking, however, is unnecessary, even harmful, although it is advised by some authors. Excessive water-drinking does not increase the excretion of uric acid; nor does increased diuresis by any means signify increased excretion of urinary solids. Water in a sense is a distinct irritant of the renal epithelium; in gouty nephritis, therefore, and in cases of beginning renal insufficiency water in excess may do harm. Where there is much arterio-sclerosis, with a weak heart muscle, the flooding of the circulation with water can only be detrimental.

On the other hand, the amount of water should not be reduced too much, for we know from clinical experience that this practice favors the formation of urinary calculi. A uric acid patient should therefore drink from one to one and one-half litres of water a day, not much more nor less.

It is better to order the frequent drinking of small quantities than the drinking of large quantities at long intervals. It is a good plan to have the patient drink one-fourth of a litre of warm water immediately before going to bed; this practice occasionally, I believe, prevents the occurrence of nocturnal attacks of gout. In fact, owing to the frequency with which gouty seizures appear in the night, it is advisable that patients as a routine measure should eat a frugal evening meal and should drink warm water before going to bed.

Mineral waters

The favorable effects that are said to be derived from the use of numerous well advertised mineral waters are probably due to the water, and not to the salt in solution; the so-called uric-acid-solvent virtues of many of these salts seem highly problematical to me (see below).

Tea, coffee, cocoa

Tea, coffee, cocoa are usually considered bad. I think their use should be greatly restricted in uric acid cases. They contain certain members of the group of alloxuric bases (caffeine, theine, theobromine, adenine, etc.), and as these bodies are direct precursors of uric acid some of them are presumably in part converted into uric acid in the organism; at all events the excretion of uric acid is increased after some of these substances are given by the mouth. There is, moreover, some evidence to show that these compounds may directly irritate the kidneys and the circulatory apparatus, also the digestive tract.

While excessive tea or coffee drinking is, therefore, to be absolutely condemned, the moderate use of thin tea or coffee is, I think, permissible, particularly in persons who crave these beverages. Tea is by all means preferable to coffee, for it stimulates diuresis and is not indigestible. In patients accustomed to alcohol it is also much easier to limit or stop the use of the latter if a little tea or coffee is allowed.

Alcohol

Alcohol-drinking has always been considered one of the chief causes of gout. In view of the almost universal prevalence of the alcohol habit, however, this proposition is difficult to prove. There can be no doubt that an alcoholic debauch may occasionally precipitate a gouty attack in a predisposed subject, ut sufferers from gout as a rule feel better if they abstain from alcohol. Alcohol is a direct irritant of the digestive tract, of the circulatory apparatus, and of the kidneys. No distinct and uniform effect of alcohol on the excretion of uric acid has so far been determined, notwithstanding the fact that a veritable flood of investigation has been published on this question. The food value of alcohol is of subordinate importance in goutiness, for here there is no loss of valuable pabulum in the urine as in diabetes.

Alcohol, chiefly on empirical grounds, is, therefore, as a rule, to be forbidden. At the same time we occasionally encounter a patient who does better if a small quantity of some alcoholic beverage is permitted. Champagne, sweet wines, cider, liqueurs, and malted liquors are to be absolutely avoided; dilute Rhine or Moselle wine or claret or whisky with water, all in very small doses, may at times be allowed.

As in all the other dietary regulations that I have outlined, the previous habits of the patient, his temperament and character, must be carefully considered.

It is frequently easier to enforce rigid rules in one direction if a little latitude is allowed in another, and if certain cravings and tastes—call them abnormal—are satisfied. "By association with rules that cannot be obeyed, rules that can be obeyed lose their authority."

Exercise

One of the most important elements to be considered in the treatment of the uric acid diathesis is the regulation of physical exercise. Broadly speaking, every sufferer from manifestations of the uric acid diathesis. especially when afflicted with "rheumatic" and neuralgic symptoms, should indulge in abundant but light physical exercise, carried out as much as possible in the fresh air. In view of the fact that many of these cases are of a melancholy or irascible temperament, and usually suffer from hypochondriasis, the exercises should partake of the character of sports, i. e., they should not be monotonous but should amuse and stimulate the patient. Moderate horse-back riding, golf, swimming, fencing, tennis, bicycling, rowing are all useful, and during the cold months, bowling, billiards and similar games. In view of the tendency to uratic nephritis and uratic myocarditis, that is always to be considered in these cases, no violent exercise should be indulged in, nor should exertion ever be carried to the point of fatigue. If there are nephritic or cardio-vascular changes, then passive and resisting exercises and massage become exceedingly useful.

Massage

Baths

Baths also occupy an important place in the treatment of the uric acid diathesis. If it is possible the patient should be advised, for a month or so of each year, to undergo a course of treatment in some watering place where he can have the benefit of hot baths combined with massage and exercises such as those specified above. The careful regulation of the régime, as it is generally carried out in resorts, combined with rest and respite from daily work and worries, usually exercises a most beneficial effect upon these cases. The choice of the bath is difficult and I am inclined to believe that the temperature of the waters and the mode of administering these baths are more important than the chemical ingredients the waters may contain; it is in most cases of small importance whether the water contains salt or carbonic acid or sulphids, or whether a mud or a fango bath is given. At home warm bathing should also be encouraged and the patient should, at least two or three times a week, take a hot bath, a few degrees above the body temperature, preferably lying still in the tub for ten minutes at a time. After the bath a vigorous rub with a rough towel, followed by a general massage with cocoa butter or olive oil, is often of great value. Hot bathing of this kind, however, is distinctly contra-indicated in cases suffering from cardio-vascular or nephritic manifestations of the uric acid diathesis, and immeasurable harm is undoubtedly done in many of these cases by a routine treatment which ignores these elements. All hydro-therapeutic procedures, Turkish or Roman baths are, as a rule, too severe for these patients, particularly in view of the neurotic complications and also the changes about the heart and arteries that are present in the great majority of them.

Resort treatment

Hot bathing

Contra-indications

Hydrotherapy in general

Medicaments

The medicinal treatment of the uric acid diathesis will be discussed in full in the Section on *Nephrolithiasis Urica* (see page 230), and I refer to those paragraphs for the use and abuse, the fallacies and inconsistencies of most so-called uric acid remedies, particularly the uric acid "solvents."

Complications and sequelae

Certain complications and sequelæ of the uric acid diathesis require special treatment. Many of these signs disappear promptly upon the onset of a regular gouty attack and most of them are best treated, like the complications of diabetes and obesity, by correcting the underlying metabolic perversion. In view of the important part that the state of the digestive apparatus plays in the production of lithemic manifestations, particular attention should be bestowed upon the gastro-intestinal tract and the liver. Here the syndrome of functional hepatic insufficiency must always be considered and treated, as described in the Chapter on *Diseases of the Liver* (see page 488). If the diet is arranged as outlined above gastro-enteric symptoms are not very liable to supervene; if they should appear,

Hepatic insufficiency

Dyspepsia

their symptomatic treatment differs in no way from that of other forms of gastric or intestinal dyspepsia, as elsewhere described. Constipation is very common and should be energetically combated. Intestinal putrefaction should never be permitted to go on unchecked. For this reason free evacuation of the bowel contents, either by the use of vegetable cathartics or preferably of salines, should be promoted, and, in addition, such remedies administered that we know can hold intestinal putrefaction in check. The latter have been discussed in full under the heading of *Intestinal Antisepsis* (see index). The chronic catarrhal conditions about the throat and respiratory apparatus; the skin affections; the "rheumatic" pains in the muscles; the anemia and cachexia; the nephritic manifestations; complicating diabetes and obesity, should all be attacked by trying to correct the perversion of the patient's metabolism chiefly by diet, exercise and hydrotherapy, and, in addition, symptomatically as described under these different diseases.

Constipation

Catarrhal conditions

Anemia
Diabetes
Obesity

The tophi rarely call for special treatment. Particular care should be taken not to remove them surgically nor to allow patients to try to squeeze or scratch the concretions out; for in the uric acid diathesis there is an increased vulnerability of the skin and subcutaneous tissues, so that even mild surgical procedures or surface injuries frequently induce erysipelas, cellulitis with ulcers and obstinate fistulæ or even gangrene of the parts.

Tophi

Skin lesions

Before discussing the treatment of the acute attack of gout, the general principles that should govern the treatment of so-called retrocedent or metastatic gout may be briefly considered.

Retrocedent gout

RETROCEDENT GOUT.

It is well known that occasionally the joint manifestations of gout will rapidly disappear and in their place a variety of distressing and dangerous cerebral symptoms develop. The latter manifest themselves as *cerebral gout* by headache, vertigo and even apoplectic seizures (gouty encephalopathy); as *cardiac gout* by severe cardiac pain, syncope or collapse; as *gastro-intestinal, vesical* or *cutaneous* gout with corresponding manifestations.

Retrocedent gout

The sovereign therapeutic indication in all of these cases is to reinduce a regular articular paroxysm. This can best be done either by placing the feet into hot mustard water or by rubbing the dorsum of the foot, and particularly the large toe, with an alcoholic solution of turpentine followed by the appli-

Induction of regular articular paroxysm

cation of heat, and wrapping the parts in cotton. The cerebral symptoms, provided they do not promptly disappear when the articular paroxysm is produced, should be treated by the application of cold to the head and by venesection. If the stomach symptoms predominate, then vomiting should be produced by the use of emetics and counter-irritation over the epigastrium, preferably cold. The heart collapse calls for the use of analeptics, scil. camphor, ether and the application of cold over the precordial region.

THE ACUTE ATTACK OF GOUT.*

Danger of aborting acute paroxysms

Local treatment

Immobilization

Any attempt to abort the acute paroxysm of gout is to be condemned; for by suppressing local symptoms much danger can arise to the organism at large. The local treatment consists in the immobilization of the affected joint, the patient remaining in a recumbent position, at least in the beginning, with the diseased limb elevated and covered with cotton or flannel. No pressure should be exercised upon the affected joint. Cold should never be applied, because it retards the circulation and aggravates the local condition, and may even lead to the development of necrosis and to the permanent deposit of urates.

Lotions

A variety of lotions have been recommended for local use. Whisky and water applied on lint is very grateful, or a drachm of sulphuric ether in six ounces of water may be used. Laudanum and water and belladonna liniment with morphia are recommended by Garrod.

The following liniment is advised by Duckworth:

℞

Atropin,	3 grains.
Morphine hydrochlorate,	15 grains.
Oleic acid,	1 ounce.

M.

S. To be painted over the painful joint with a large camel's hair brush and carded cotton to be superimposed.

Anodyne applications

Camphor-menthol, made by rubbing up together three parts of menthol with two of camphor, forms a useful anodyne application; or half an ounce of menthol may be dissolved in six ounces of spirits of camphor for a lotion. Any application that occludes the sweat ducts, like collodion or medicated powders, should be eschewed. Blisters and leeches should never be applied, as the skin over the affected joints is usually very vulnerable and there is always danger of producing obstinate eczema, furunculosis or even gangrene. Heat is always grateful, preferably applied in the form of hot fomentations or poultices. Massage of the affected joint should be reserved until the third or fourth day of the paroxysm, but had better not be administered in the beginning of the attack. Usually the pain produced by the massage, or by any movement of the joint, of itself forbids this measure.

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*Acute paroxysms of gout are rarely seen in this country. Inasmuch, therefore, as my personal experience with this manifestation of the uric acid diathesis is relatively limited, I submit in broad outline the combined authoritative statements of Duckworth, Garrod, Roberts and Latham on the treatment of this disease.

Blisters and leeches

Heat

Massage

The internal treatment of the acute gouty attack consists in the administration at once of a purge. One or two grains of calomel with two to six grains of the compound pill of colocynth and extract of hyoscyamus (Pil. colocynth et hyoscyami, B. P.) should be given at night, followed in the morning by a Seidlitz powder or some other saline aperient.

Internal treatment

Purging

As soon as the attack is fully developed colchicum becomes the sovereign remedy. This drug may be considered almost a specific, at least for relieving the pain in a gouty paroxysm. In order to continue the laxative effect inaugurated by the calomel, colocynth and hyoscine, twenty grains of carbonate of magnesium may be added to each dose of colchicum. The favorite prescription employed in St. Batholomew's hospital is the so-called *Haustus Colchici*, containing:

Colchicum

Magnesium carbonate,	10 grains.
Tincture of colchicum seed,	20 minims.
Peppermint water,	1 ounce.

This dose to be given every night; half the dose in the morning.

The treatment is continued for three or four days and then two or three grains each of the extract of colchicum, combined with a compound colocynth pill (see above), are given every night.

The most satisfactory preparation of colchicum is the wine: for it does not possess such violent purgative properties as the preparations of the seed. The use of colchicine either by mouth or hypodermically is condemned as useless and not without danger by leading authorities. The symptoms of colchicine intoxication consist in depression, nausea and purging, and sweating, the stools assuming a characteristic green color. It is rarely necessary to give the drug in such large doses that

Preparations of colchicum

purging is produced. The appearance of severe depression and violent purging, and a great fall in the arterial pressure with profuse sweating, call for a reduction of the dose or temporary discontinuation of the remedy.

Sodium salicylate Sodium salicylate also enjoys great popularity. In order to do any good it should be given in large quantities of from one to two drachms (4 to 8 gm.) a day, in doses of fifteen grains (1 gm.), repeated four or eight times during the twenty-four hours. Very frequently the good effects of salicylates persist only for two or three days, then the common anti-neuralgics, **Anti-neuralgics** phenacetin, antipyrin, aspirin, etc. (see index), may be given. Urocine and sidonal, the former the lithium salt, the latter **Quinic acid** the piperazin salt of quinic acid, are also recommended, but they are by no means so effective nor so reliable as colchicum or the salicylates. Most clinicians speak very highly of the **Alkalies** use of the alkalies, viz., sodium, potassium and lithium carbonate or citrate, in acute gout.

Diet The diet during the acute paroxysm should consist largely of milk, bread, toast, crackers and cereals, and broths. Fresh fruits and vegetable acid foods should be omitted from the **Water** dietary. The patient should drink large quantities of water, **Alcohol** preferably some alkaline mineral water. Alcohol should be absolutely forbidden.

To prevent recurrences In order to prevent the recurrence of acute attacks of gout during the stage of convalescence, the wine of colchicum, given in small doses, is the best remedy. Duckworth recommends five or six drops of the wine or tincture twice a day, or a grain of the extract in pill at night, to be continued for a long time after the subsidence of the acute attack.

Iodides Occasionally the pain in the joint persists for a long time after the acute paroxysm is over; here the iodide of potassium or of ammonium, in doses of five grains (0.3 gm.) three times a day, preferably combined with five to ten drops of the wine of colchicum, is the best remedy.

V. RACHITIS.

Definition This disease, as the names rachitis and rickets indicate, is commonly interpreted to be a disease of the bony structures of the body. While the bony deformities are a prominent symptom they are by no means the determining manifestation of the disease. Rachitis must be regarded as a general nutritional, i. e., a metabolic, disorder. The diagnosis, it is true, is, as a rule, made from the bony changes, namely, the square head, the open fontanelles, the beaded ribs, the enlarged bone ends, the curved arms and legs, the pigeon breast, the contracted pelvis, the deformed spine, and backwardness in teething. As important as the osseous deformities, however, are the involvement of the lymph glands and the enlargement of the liver and spleen, the general muscular flabbiness, the anemia, the catarrhal condition of all the mucous membranes and the instability of the motor system with the well-known tendency to convulsions, tetany, laryngismus stridulus, glottis spasm, and tonic contractions about the hands and feet.

Prophylaxis

Intelligent prophylaxis can often prevent the onset of the disorder. That we may institute the necessary preventative measures and properly treat the disease after it is fully developed, it is necessary to analyze the underlying etiological elements that produce rachitis. A great number of factors have been accused of causing rickets. An inherited tendency has been incriminated, as well as congenital syphilis, poor general hygiene, lack of light and air, and, above all, a variety of food factors. A careful analysis of all these causes shows that the most important element of all is the food factor.

Hereditary element

As far as the hereditary element is concerned there is no definite evidence to show that rachitic parents are more apt to have rickety children than healthy parents. This is readily understood when one considers that rickets is a disease of childhood and never persists into adult age so that the existence of rickets in the parent at one time may not be easy to determine. As a matter of fact, rickety children, as a rule, are the offspring of healthy parents who never showed rickety tendencies during their childhood. Fetal rickets, so-called, is probably not rickets at all, but a form of cretinism. Congenital rickets undoubtedly occurs, but only if the health of the mother is poor; here a nutritional and not an hereditary element is at play.

Syphilis and rickets

Congenital syphilis, according to the best authorities, does not produce rickets. In most cases of rickets the typical syphilitic phenomena are absent and, on the other hand, most cases of congenital syphilis do not show rickety signs. The combination of the two undoubtedly can, and frequently does, occur, and in this way a peculiar disease picture is created in which it is often difficult to distinguish the syphilitic from the rachitic elements.

General hygiene

That lack of light and air, and life in damp, dark dwellings alone cannot produce rickets is made manifest by the frequent appearance of rickets in children of the well-to-do classes who live under ideal hygienic conditions. That malhygiene by favoring malnutrition and lowering the tone of the infantile organism can favor the development of rickets, provided food errors are at the same time committed is, of course, self-evident. A child, however, may live in the most unhealthy surroundings without developing rickets, provided it is fed according to correct principles.

Quantity of the food

That the quantity of food, finally, does not produce rickets is made clear by the appearance of the disease in fat children, while, on the contrary, children in advanced stages of atrophy may not develop, in fact, rarely do develop, rickets. Broadly speaking the statement can be made that qualitative, and not quantitative, errors of feeding produce most cases of rickets. It is also important to note in passing that breast-fed children, provided the mother is healthy, hardly ever develop rickets, whereas, children who are fed on artificial foods, particularly of the farinaceous variety, are very apt to develop the disease, unless a sufficient quantity of animal albumen and fat, as will be presently shown, is added to the diet.

What elements are deficient?

The question arises what elements are deficient in the food of children who develop rickets; and what elements must therefore be supplied in order to prevent the development of the disease?

Lime salts

As the percentage of lime salts in rachitic bones is below normal, the theory has been advanced that the disease is due to deficient mineral matter, especially lime salts, in the food. This postulate is refuted by the observation that children living on farinaceous foods which contain an abundance of lime salts are particularly liable to develop the disease, and by the further observation that the addition of lime water to artificial foods is in no way capable of preventing rickets.

Lactic acid

Some clinicians believe that the lactic acid produced by the fermentation of imperfectly digested starchy foods in the stomach, can be made responsible for the development of rickets; they assume that lactic acid entering the circulation dissolves the lime out of the bones. This theory is opposed by the observations that rickets develops in individuals who are not suffering from fermentative dyspepsia and who readily assimilate all the starchy food that is given them; besides, rickety children improve rapidly if the farinaceous diet is continued and if only sufficient proteid and fat is added to the diet. Finally, free lactic acid could never circulate in the blood, for it would at once combine with alkalies and circulate as lactate, that is, in a form that could not dissolve the lime salts of bones.

Three elements lacking, viz., 'at, proteid, earthy sphates

The preponderance of all positive evidence submitted indicates clearly that in all cases of rickets three elements chiefly are lacking from the food; namely, a sufficient quantity of animal fat, of animal proteid and of earthy phosphates.

Cheadle expresses himself as follows in regard to the deficit of fat, proteid and lime phosphate in rickets: "The dependence of rickets on the deficiency of these three elements of food would explain something more than the mere bone changes; it would clearly explain the imperfect nutrition of brain, muscle and nerve structure, which mere excess of lactic acid or absence of lime salts would not account for. It explains, moreover, why rickets is so prevalent in large towns and dense populations, where milk is so scarce and dear, deprived of cream and watered, and the poor driven to feeding their children on the cheaper farinaceous foods."

Gastro-intestinal disorders

One other etiologic factor must be mentioned, viz., chronic gastro-intestinal disorders, especially if they produce vomiting and diarrhea. Whenever such disorders are present the child practically becomes starved despite the administration of plenty of food; the proteids and fats chiefly are wasted under these circumstances because they must undergo certain preliminary changes, which require time, before they can be assimilated, whereas, the carbohydrates, being ingested largely in the form of sugar of milk, are promptly absorbed. This explains why cases of rickets occasionally develop in dyspeptic children who are fed on good cows' milk diluted in the proper proportion and containing all the elements that make up the correct diet for the child.

Prophylaxis

From all that has been said the prevention and cure of rickets is a comparatively simple problem, and in few diseases are so gratifying results obtained from proper feeding. In rickets, above all things, the gastro-intestinal tract, for reasons mentioned in the preceding paragraph, should be treated in such a way that catarrhal conditions are corrected. The food, moreover, should contain an abundance of animal proteid, of animal fat and of phosphate of lime.

Raw meat juice

In view of the fact that many children cannot digest large quantities of milk casein, which would be the ideal proteid, the deficiency of animal albumen must often be supplied by raw meat juice. This is prepared as follows: Steak is finely chopped up and stirred with cold water in the proportion of one part of water to four parts of meat; this mixture is allowed to stand for half an hour in the cold and the juice is then expressed through a cloth or through a meat press. The meat juice obtained in this way is very rich in albumen and extractives and constitutes an ideal means of supplying nitrogen. The meat juice can be mixed with milk without coagulating it and without perceptibly flavoring it. It also renders the milk coagulates fine and flocculent. The quantity of this raw meat juice that may be given in the place of casein is from one and one-half to three ounces in the twenty-four hours. In preparing an artificial mixture with meat juice the amount of casein, therefore, that is withheld should be calculated and an equivalent amount of meat juice added[*]

Cream and cod liver oil

Lime

Lacto-phosphates

That the meat juice should be prepared fresh every day and kept in a cool place need hardly be emphasized, for, otherwise, decomposition, with the formation of highly irritating poisonous products, may occur. The deficit of fat should be made up by the addition of a sufficient quantity of cream. Cream is the best source of fat for the infant and is to be preferred to codliver oil. If cream cannot be borne codliver oil may, however, be found very useful; dose, a teaspoonful two or three times a day. Lime should not be supplied as lime water, for the latter, as stated above, does not seem to fulfill the desired purpose. As a rule, if raw meat juice is given, or if plenty of good milk is used in the preparation of the artificial food, the addition of lime phosphates is rarely necessary. If lime salts, however, must be supplied artificially, then they can very advantageously be given in the form of the lacto-phosphate prepared as follows:

℞

Calcium phosphate,	12.5
Lactic acid,	15.0
Distilled water,	330.0
Sugar of milk,	630.0
Tincture aurant q. s., ad.,	1000.0

M.

Dose, two to four dessertspoonfuls a day.
(Ortner.)

Or the calcium lacto-phosphate may be given in water as follows:

℞

Calcium lacto-phosphate,	15.0
Water,	200.0

M.

A dessertspoonful three times a day.

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[*] The rules governing the exact proportions of proteids, fats, carbohydrates and mineral salts that should be contained in the different artificially prepared infant foods for different ages cannot be discussed within the narrow frame of this book. I must refer for information on this subject to text-books on Pediatrics.

Phosphorus

Some very capable clinicians recommend the administration of phosphorus in this disease; others, again, claim that its administration is unnecessary, provided the above dietetic rules are carefully carried out. Nevertheless, good results occasionally accrue from phosphorus treatment. The remedy is best given in combination with codliver oil, according to the following formula:

℞

Phosphorus,	0.01
Codliver oil,	100.00

M.

This mixture contains about ½ mg. phosphorus to the teaspoonful; one or two teaspoonfuls a day should be given.

Hydrotherapy

Hydro-therapy, too, has a place in the treatment of rickets. Cold applications are dangerous in the fully developed stages of the disease. As a prophylactic measure, however, bathing the infant daily with warm water that is gradually cooled down to 20° C. is exceedingly useful.

Orthopedics

The extremities and the spinal column of the child should be protected against the development of deformities by forbidding standing and by carrying the child in such a way that no curvature of the spine or extremities can develop. The technique of these self-evident precautionary measures, as well as the correction of the fully developed deformities, belong to the field of Orthopedics and Surgery and need not be elaborated upon in this volume.

VI. OSTEOMALACIA.

Phosphorus and codliver oil

Osteomalacia is closely related to rickets, and the medicamentous treatment of the two diseases is practically the same. Here the combination of phosphorus and codliver oil that has been mentioned above is particularly useful. Inasmuch as this disease usually develops in adult life, the dose of phosphorus may be larger than in an infant, as much as 4 to 6 mg. of phosphorus being administered during the day and continued for months. Sometimes codliver oil is not well tolerated and then phosphorus in the dose of 0.01 gm. may be given in the form of pills or in chocolate-coated tablets.

Calcium

Calcium has been frequently recommended in the treatment of osteomalacia, and it can do no harm to give these patients ten to fifteen grains of a mixture of calcium carbonate and calcium phosphate in

Anemic medication capsule several times a day. Inasmuch as many of these patients are anemic, the following capsule is useful:

℞

Arsenious acid,	1-100 gr.	(1 mg.)
Reduced iron,	2 grs.	(0.1 gm.)
Calcium phosphate,	5 grs.	(0.3 gm.)
Calcium carbonate,	10 grs.	(0.6 gm.)

M.

One such capsule three times a day.

Atropine A form of treatment that has been warmly recommended recently is the use of atropine. Its action in osteomalacia is altogether obscure. The dose should be regulated according to the appearance of symptoms of atropine poisoning. It is always well to begin with small doses of about one-two-hundredth grain three times a day, and gradually to increase the dose until atropine symptoms appear, as manifested by dryness of the mouth, dilatation of the pupils, etc.

Diet and hygiene The diet in osteomalacia should be arranged according to similar principles as the diet in rachitis, i. e., there should be an abundance of albuminous and fat food. The state of the digestive apparatus should be carefully regulated, and ideal conditions as regards light and air and dwelling should be created. Here, too, during the florid stage of the disease the prevention of deformities and contractures must be considered. The orthopedic and surgical measures employed are the same as those in rachitis and cannot be entered into here.

VII. DIABETES INSIPIDUS.

Definition

Symptomatic polyurias

Diabetes insipidus is a name employed loosely to designate a variety of symptomatic polyurias that may be due to different causes. Provided one is dealing with a simple polyuria not due to cardio-vascular or renal disease, then the possibility of a cerebral or spinal origin, or of hysteria, must be seriously taken into consideration in every case and treatment instituted accordingly. In view of the fact that a number of syphilitic lesions of the cerebro-spinal axis are capable of producing symptomatic polyuria, every case of diabetes insipidus that does not yield to the measures to be presently described, should be given the benefit of an energetic antiluetic treatment. In such cases very large doses of iodide of potash, i. e., as much as two hundred or three hundred grains a day, preferably combined with mercury inunctions or hypodermic injections of mercury salts, should be given (see *Syphilis*).

Hysterical polyurias

The treatment of hysterical polyuria, which is often called diabetes insipidus, is synonymous with the treatment of hysteria. Quite a few cases of so-called diabetes insipidus are on record for instance that were cured by hypnotism, others again by carefully carried out rest treatment or hydro-therapeutic measures directed against the underlying hysterical perversion.

Valerian
Bromides
Asafetida
Antipyrin

In view of the fact that most sufferers from diabetes insipidus are nervous people, valerian, bromide of potash, camphor, asafetida and antipyrin all have a distinct field of usefulness in this disease. I have never seen any good results follow the use of atropine or of other preparations of belladonna that have been recommended for the purpose of "checking the secretion of the kidneys;" the dryness of the mouth, in fact, which atropine produces usually increases the thirst and hence favors rather than checks the polyuria.

Ergot

Ergot may be used and not infrequently produces good results. Its exact mode of action is not understood, but it presumably exercises its effect upon the blood vessels of the kidney. Its action can best be explained as follows: The amount of urine excreted depends upon the blood pressure in the glomerules and the more the renal arteries become contracted under the influence of ergot the smaller the amount of blood that enters the glomerules and the smaller consequently the flow of urine.

Galvanization of the cervical sympathetic

A measure that is often useful is galvanization of the sympathetic in the neck, as described under *Exophthalmic Goitre* (see page 106). It is not impossible that the galvanic current directed from the angle of the jaw to the back of the neck into the region of the lower cervical vertebræ actually exercises an effect upon the medulla itself which may reduce the polyuria. This assumption, however, is difficult to prove and the element of suggestion from the electrical treatment can never be excluded, especially in a disease which is so so commonly combined with hysteria. Electricity, however, should be given a fair trial.

Reduction of the liquid intake

The most rational procedure of all is to reduce the liquid intake, and at the same time to promote the elimination of water through other emunctories of the body than the kidney. Drink restriction, as a rule, exercises a pronounced effect upon the amount of excreted urine, in fact, some cures have been reported from complete withdrawal of liquids for a period of twenty-four or forty-eight hours. This procedure is exceedingly irksome to the patients and requires the exercise of much will power. The distressing thirst can be counteracted in a measure by smoking, chewing gum or swallowing small ice pills. In order to carry out the thirst treatment properly it is usually necessary to put the patients to bed and to treat them as one would an hysteric under restraint. If it is desired to sweat the patients, pilocarpine may be given to advantage, preferably hypodermically in the dose of 0.01 to 0.015, twice daily; or the hydro-therapeutic measures for promoting diaphoresis that have been fully described on pages 42, 43 may be utilized.

Sweating

CHAPTER V.

DISEASES OF THE URINARY APPARATUS.

I. NEPHRITIS.

Classification

The classification of nephritis, if we are to follow orthodox standards, is highly confusing. From the anatomic, i. e., descriptive pathologic standpoint, the matter is simple enough; from the clinical, i. e., the diagnostic and therapeutic standpoint, the anatomic classification is in a large measure useless. Clinically, we should distinguish (1), an acute nephritis; (2), a chronic parenchymatous or interstitial nephritis developing either consecutively to an acute nephritis or slowly and insidiously from the beginning; (3), different types of "vascular" nephritis (cardio-renal disease), i. e., of nephritis due to impaired circulation in the kidneys with resulting degenerative changes in the organ; to the latter category belong, e. g., the nephritis of Bright's disease, in the modern sense, and the nephritis of arterio-sclerosis.

The matter is further complicated by the fact that in all forms of chronic nephritis cardio-vascular signs develop sooner or later; so that it is often a difficult matter to determine whether the changes about the heart and arteries are the primary event that produces the nephritis, or whether the nephritis causes retention of excrementitious bodies that poison the heart and arteries, or, finally, whether the same primary cause simultaneously affects both the cardio-vascular apparatus and the kidneys. From a therapeutic point of view it is very important to decide this matter, and I intend in the following discussion of chronic nephritis to consider as belonging to the second category those forms in which the cardio-vascular signs appear after the nephritis, and to the third category ("vascular nephritis") those forms that are either directly preceded by, and traceable to, cardio-vascular disease or that develop simultaneously with cardiac and arterial disturbances.

As far as the further differentiation of nephritis into the parenchymatous and the interstitial forms is concerned, I consider that unimportant in the therapeutic sense, for there is never a parenchymatous inflammation without some interstitial changes, nor vice versa. The involvement of the renal parenchyma or of the interstitial tissues of the kidney will depend altogether upon the kind, the virulence, the selective affinities of the various toxic and infectious agents that produce the nephritis, upon the length of time during which they irritate the kidneys and upon the path by which they reach them. Generally speaking the more chronic the nephritis the more marked the interstitial changes. In the vascular type, too, interstitial changes usually predominate.

ACUTE NEPHRITIS.

Prophylaxis

To the kidneys is relegated the chief disintoxicating function of the organism, hence they are particularly susceptible to injury by any toxic or infectious material that may gain entrance to the circulation. Recognizing this fact it is occasionally possible, in certain infectious diseases, to prevent the development of nephritis as a complication, first, by giving such abundant quantities of fluid early in the disease that whatever toxins are carried through the renal filter are thoroughly diluted and hence not so apt to irritate and inflame the renal epithelia in transit; second, by avoiding the administration of remedies that can irritate the kidneys.* In some diseases, moreover, energetic causal treatment instituted early may save the kidneys; thus in malaria an active quinine treatment may often prevent the development of nephritis, and in syphilis, paradoxical as it may sound, an energetic mercury treatment may also prevent renal complications, notwithstanding the fact that mercury in itself is capable of irritating the kidneys.

Abundant water drinking

The administration of abundant quantities of water in acute infectious diseases is a useful procedure, only, however, while the renal filter is still permeable for water and before pronounced nephritic changes have appeared. When nephritis has once set in the administration of water should be reduced considerably, at least during the period of acute inflammation, and the administration of large quantities of water should not be resumed until the nephritic process is in course of healing. One should be guided, in this matter, largely by the function of the kidneys; when they stop excreting abundantly it is bad practice to try to force them to eliminate water, and one should wait with abundant water-drinking until the kidneys indicate by increased diuresis that they are again capable of excreting water. Of this more below when discussing the diet in acute nephritis.

Restriction of liquids

Diet

The diet, in acute nephritis, should, during the stage of inflammation, be scanty and bland. The principle of sparing the kidneys by relieving them of the task of excreting much solid excrement is the prime indication and should be carefully observed. In certain infectious diseases of short duration it is not a bad plan to withhold food altogether for a period of two or three days, allowing the patient only enough water to allay the thirst and to compensate for the loss of water through the breath and the sweat glands. This treatment is heroic, but, especially in children, the results are so gratifying as to warrant its employment. The fact that the patients are forced to consume their own tissues and are inadequately nourished by this procedure need not militate against the starvation treatment, inasmuch as under-nutrition, lasting for two or three days only, can do no harm. In chronic forms of nephritis the starvation plan, or even continuous under-feeding, with the object of sparing the kidneys, is, of course, never permissible, as will be shown at length later on.

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*Salicylic acid preparations, chlorate of potash, most of the balsams, tar, turpentine, cantharides, etc.

Starvation

If one is justified in assuming that the acute nephritic inflammation will last longer than two or three days, or if the renal complication does not rapidly yield to complete withdrawal of food, then milk is the best nutrient. It should constitute, in acute nephritis, the only food until the nephritic process has entered into the sub-acute stage. Occasionally a patient cannot bear milk, either on account of an aversion to it, or on account of inability to digest it; in such cases the administration of small quantities of milk, in tablespoonful doses, given ice cold and possibly with the addition of a little lime water or some flavoring extract, will often render its administration possible. If there is complete intolerance or aversion to milk, then buttermilk or kefir or kumyss can frequently be borne, and while these beverages do not possess the nutritive value of an equivalent of milk, still they serve a very useful purpose. The quantity of milk must vary according to the individual case, but more than one litre should rarely be given during the twenty-four hours. In order to increase the nutritive value of the milk cream may be added; a tumbler full of milk-cream mixture, containing four parts of milk and one part of cream, with one tablespoonful of lime water, administered every two or three hours, suffices to adequately nourish the patient, and at the same time to spare the kidneys during the acute and sub-acute stages of the nephritis.

Milk

Buttermilk
Kumyss
Kefir

During the stage of healing it becomes necessary to nourish the patient more generously. This can be done with safety by allowing soups made of oatmeal, rice and barley, a little bread or zwieback, some fresh fruit and boiled vegetables. Meat extracts or bouillons exercise a beneficial and stimulating effect upon the appetite and the gastric digestion without, at the same

Diet during the stage of healing

time, containing elements that markedly irritate the kidneys; nor do they, it is true, contain any elements that are particularly nourishing, hence they can hardly be considered a food, as their caloric value (see page 157) is very small. Later the ordinary mixed diet should be resumed, always under careful supervision of the urine, in order to control the effect of a liberal diet upon the healing of the nephritic process.

Meat

Meat should preferably be withheld until the healing is well advanced. I do not think that the kind of meat makes much difference, although possibly, in honor of an old fashioned prejudice, light meats may be given the preference over dark meats.

Rest

Position in bed

As soon as symptoms of acute nephritis make their appearance the patient should be put to bed and kept absolutely quiet until the inflammation of the kidneys subsides. As a rule nephritic cases lie on their back, but it is a very good plan, if they can comfortably do so, to have them lie on the abdomen, at least during part of the day. They should at all events frequently change their position in bed, for in this way, hypostatic congestion of the kidneys is prevented, and, in many cases, the pain in the lumbar region is markedly reduced. The patient should remain in bed until the albumin has disappeared from the urine. Even after this stage has been reached, the patient should at first arise for a short time only each day, and never within an hour or two after a meal. The urine should be carefully controlled daily and the patient ordered back to bed as soon as albumin reappears upon exertion. Unless this precaution is taken chronic nephritis is very apt to develop.

Catching cold

Clothing during convalescence

Nephritics or individuals who have just recovered from acute nephritis are very liable to catch cold. Possibly there is in such cases a lowering of the tone of the vaso-motor centres as a result of the renal intoxication. Particular precautions should be therefore taken to prevent taking cold, according to the principles discussed on page 266. Convalescents from acute nephritis should at all events always wear a flannel binder covering the kidney region for many months after recovery, and should be warned particularly against exposing themselves to wet or cold.

Symptomatic treatment

Counter-irritants to renal region

The symptomatic treatment of acute nephritis includes among other things the relief of the pain in the kidney region that is often quite distressing. Remembering always that no drug should be given in nephritis that can irritate the kidneys, care should be taken in selecting proper counter-irritants to be applied to the lumbar region. Thus cantharidal ointments or plasters, or mustard poultices and plasters, that are very useful as revulsives, should never be used in acute nephritis. Cupping or the application of leeches is, however, a very useful treatment for the relief of renal pain. The galvano-cautery may be employed to advantage, especially when applied over Petit's triangle,* for the veins in this area anastomose with the veins of the renal capsule so that congestion within and around the kidneys can be effectively relieved by counter-irritation over this particular point. Cups, leeches or the cautery may be advantageously applied throughout the whole duration of the acute stage, for they can never do any harm and frequently seem to exercise a very beneficial effect, especially upon the pain and the reflex nervous symptoms of renal origin, viz., the headache, nervousness and vomiting.

Drugs to reduce albuminuria

Different drugs have been recommended from time to time for reducing the albuminuria. Aside from the fact that the excretion of albumin is a symptom of subordinate importance as far as any effect upon the nutrition of the patient is concerned, so that it hardly calls for special treatment, the various remedies used cannot be considered efficacious even to fulfill the purpose for which they are intended. They are mentioned merely on account of their historical interest. Thus tannin and tannalbin, methyl violet and methylene blue, strontium bromide and ichthyol and sodium benzoate, fuchsin and nitric acid all have their advocates, but none of them, in my experience, is of any benefit whatsoever in the treatment of acute nephritis.

Hematuria

In case there is very much hematuria ergot may be given, although the loss of blood is usually too insignificant to warrant special consideration. Ergot should be given in the form of the fluid extract, 15 m. to 1 dr. (1.0 to 4.0) or the infusion 1 to 2 oz. (16 to 32 cc.).

Anuria

The suppression of urine occasionally calls for treatment although as a rule it is best to allow Nature to take its course and to wait a few days without active interference until the kidneys spontaneously resume their function (see also page 210). To force the kidneys to pass water always means to irritate them; there is, moreover, no tangible evidence to show that the promotion of diuresis by drugs really promotes the elimination at the same time of large quantities of urinary solids, so that the slight advantages accruing from forced diuresis are, as a rule, more than counter-balanced by the damage inflicted upon the kidneys by the diuretics employed.

Vicarious elimination

The elimination of retained urinary bodies should, therefore, be promoted not by crowding them through the kidneys but by favoring their vicarious elimination through the bowel, and,

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[*] **Petit's triangle** is the area bounded by the crest of the ilium below, the latissimus dorsi and the external abdominal oblique on each side.

so far as that is possible, through the sweat glands. It is more important, as shown above, to regulate the diet in such a way that only small amounts of excrementitious bodies have to clamor for elimination through the closed renal filter, than to feed injudiciously and try to force urinary bodies through a barrier that Nature has closed for the time being. It is well to remember that the chief task, in the treatment of nephritis, as of any other acute disorder, is to imitate Nature and to enforce her methods, viz., to spare the diseased organ and to keep it at rest, in order to enable it, as quickly as possible, to resume its normal function.

Milk as a diuretic

Milk itself stimulates diuresis in a perfectly physiological manner, and if the patient with nephritis fails to pass a sufficient quantity of urine on an abundant milk diet, then this, in itself, is evidence that the kidneys cannot react to the stimulus even of mild diuretics. The reduction of the flow of urine, on a milk diet, is, therefore, prognostically, a bad sign and should induce us to be particularly careful not to irritate the inflamed kidneys still further by the use of strong diuretics.

Alkalies the only legitimate diuretic in acute nephritis

The only legitimate diuretics, in the sub-acute stages of nephritis, are alkalies and alkaline mineral waters, preferably given in combination with milk. They act either by their effect upon the osmotic pressure of the blood in the kidneys and hence favor diuresis by their physical properties, or they produce, as some authors claim, a reduction in the renal congestion, without in any way irritating the diseased renal cells.

Diuretics in dangerous edemas

If the patient is suffering from severe edemas and an accumulation of fluid in the serous cavities large enough to endanger life mechanically by pressure, and if sweating and active catharsis do not relieve these dropsical swellings, then recourse must occasionally be had, as an emergency measure, to strong diuretics. As the heart in the great majority of these cases is affected (so-called nephritic edemas generally being cardiac edemas), heart tonics should always be administered in combination with a diuretic.

Heart tonics

Digitalis and caffein

No combination is more useful in such cases than the one described on page 43, in discussing cardiac dropsy, namely, digitalis with caffein. The acetate of potash is commonly used; it acts as any other alkali for it reaches the kidneys in the form of potassium carbonate. Calomel, too, may be used for its diuretic properties in these extreme cases, and should be given as described under cardiac dropsies on page 43. Diuretic teas are very popular with the laity; it is doubtful whether the herbs that are used in their preparation possess very strong diuretic powers; the ingestion of large quantities of hot

Acetate of potash

Calomel

Diuretic teas

water, however, without doubt stimulates the function of the sweat glands and possibly also of the kidneys, while the herb infusion can do no harm. One of the best of these teas is composed of equal parts of Fol. Uva Ursi and Herba Hernearia Glabra; a cup of tea made with half a teaspoonful of this mixture of the two dried herbs and sweetened with sugar should be given every two hours; especially in sub-acute nephritis a profuse diuresis can usually be stimulated by this mixture while the sweat glands also become very active.

Hydrotherapy

Most cases of acute nephritis are benefited by the use of lukewarm baths given for fifteen minutes at a time and accompanied by friction of the surfaces of the body. Such a bath should be given once a day. The effect of this practice upon the blood pressure becomes manifest, as a rule, by increased diuresis and sweating. If it is desired to produce profuse sweating, then hot baths of 35° to 40° C., should be given and the patient afterwards wrapped in warm blankets. If a profuse sweat is produced in this way, the patient should, at the same time, be given abundant quantities of water to drink, as otherwise concentration of the body fluids may be brought about, hence their toxicity be increased and the danger of uremia enhanced.

Sweating by hot baths

Sweating and abundant water drinking

One might ask what benefit could accrue from sweating on the one hand and giving abundant water on the other, especially if, as claimed above, little poisonous material is eliminated by the sweat glands. The main effect produced is an active circulation of the lymph which acts beneficially by increasing metabolism, by preventing stagnation and accumulation of toxic material in certain portions of the body, where they might do particular harm, especially in certain areas of the nervous system.

Sweating by hot air

One of the most convenient methods for producing diaphoresis is by means of the hot air bath, as described under cardiac dropsy (see page 42) or by the use of large Priessnitz compresses covering the whole body. In promoting sweating by the Priessnitz method, a sheet is wrung out of hot water, wrapped around the patient and covered with two or three woolen blankets. In order to forestall dyspnea and reactive cerebral hyperemia, the patient should be placed in a semi-recumbent position and the head kept cool with cold cloths or an ice bag. As the patients usually soon complain of thirst they should be given plenty of cold water to drink during the sweating.

Sweating by hot compresses

Sweating by pilocarpine

Pilocarpine, by subcutaneous injection, also produces a profuse sweat, but this drug should only be used if the heart is altogether intact. I consider pilocarpine dangerous in heart disease and generally superfluous in nephritis.

Catharsis

Mild catharsis may to advantage be promoted. Great care should, however, be taken not to administer drugs that can irritate the bowel, for upon the bowel chiefly is thrown the task of vicariously ridding the system of excrementitious bodies that the kidneys are for the time being unable to excrete. Any derangement of the bowel function, therefore, should be most strenuously avoided; the same applies to the liver, for it, too, assumes a disintoxicating and a vicariously eliminating function in nephritis. For these reasons calomel and all drastic purges should be used only as an emergency measure in extreme cases. Tō evacuate the bowel castor oil or cascara, of the extract two to eight grains (0.12 to 0.5 gm.), of the fluid extract ten to fifteen minims (0.6 to 1 cc.), may be safely given. Saline purgatives are to be avoided, for most salts either irritate the kidneys or are eliminated with difficulty by the kidneys when they are diseased.

Heart tonics

That it may occasionally become necessary to supply digitalis as soon as the heart begins to flag in acute nephritis, is self-evident. It is not good practice, however, to give digitalis in the beginning for the sake of its diuretic effect, because, in acute nephritis, a great strain is always thrown upon the heart sooner or later and it is decidedly dangerous to stimulate it with heart tonics before there is an urgent call for their employment.

CHRONIC NEPHRITIS AND BRIGHT'S DISEASE.

Cardio-renal disease

In addition to those forms of chronic nephritis that develop consecutively to acute nephritis, we have a variety of forms in which the involvement of the kidneys is merely one symptom of a general toxemia, and in which the disorder about the heart and arteries dominates the picture. In some forms the disease seems to affect the kidneys first, and later the heart and arteries; in others the toxemia seems to involve simultaneously the heart and arteries.

The newer conception of Bright's disease

The latter variety, according to our newer idea, is true Bright's disease. It is unfortunate that the name Bright's disease is retained at all in our medical nomenclature, for what we understand by this term, and what Richard Bright originally described, are two very different things. It is still more unfortunate that the terms Bright's disease and chronic nephritis are so commonly employed synonymously; for Bright's disease, in the modern sense, is a systemic disorder that usually produces nephritis, but does not invariably do so, whereas chronic nephritis, while often due to Bright's disease may also be due to a great many other causes.

In Bright's disease the determining feature is high arterial tension, with resulting cardio-vascular changes and nutritional disorders in various parts of the body, and, particularly, in those organs that are supplied by end-arteries, viz., the kidneys, the retina, and the brain. The treatment of this so-called vascular type of nephritis is therefore practically synonymous with the treatment of the cardio-vascular apparatus; for cardio-vascular disorders generally usher in these forms of nephritis or appear soon after nephritic signs become apparent; and cardio-vascular complications generally produce the death of these patients. Cases of this type of nephritis should be treated, therefore, more as heart cases than as kidney cases, and for this reason the rules of treatment that have been laid down in the Chapter on *Heart Diseases*, particularly in the paragraphs on the treatment of valvular diseases of the heart in the stage of compensation, apply, broadly speaking, to this type of nephritis.

Causal treatment

Causal treatment of any variety of chronic nephritis must concern itself primarily with combating or preventing the toxemia that, in all probability, produces both the cardio-vascular changes and the nephritis. The character of this toxemia is still obscure. The preponderance of clinical evidence, however, points to a disordered gastro-intestinal tract and liver, on the one hand, and to metabolic derangement on the other, as the sources of the poisons. Treatment should, therefore, in many cases be directed towards correcting any digestive or hepatic disorders that may be present. The obscure metabolic perversions that sometimes underlie the disease unfortunately offer nothing very tangible to attack.

Bowel origin of chronic nephritis

A deranged bowel function leads to the abnormal disassimilation of albumins, chiefly because putrefactive bacteria gain unopposed sway. The toxic albuminoids and alkaloids generated in this way flood the liver channels, where they should normally be arrested or disinfected. For a while the hepatic cells can withstand the stream of toxic matter that circulates around and through them and can properly exercise their disinfecting properties; but an overwhelming mass of putrefactive material flooding them at one time, or small quantities of putrid excrement irritating them continuously, must needs impair their function and render them inadequate to protect the organism as a whole from poisoning. When this occurs intestinal twenty grains (1.2 gm.) of bismuth subnitrate in the twenty-four hours. The latter is given merely as an indicator of the presence or absence of sulphids (sulphureted hydrogen or its salts) from the feces. H_2S or its alkali salts form black bismuth sulphid, and when the intestinal antiseptic is given in sufficient quantity to check the putrefaction of albumin, then no bismuth sulphid is formed and the stools are not colored black.

It will be found in most cases that when the stools retain a light color, despite the administration of bismuth, the indican of the urine and the other aromatic urinary ingredients will also disappear or become greatly reduced.

The proper dose, then, of the above-named intestinal antiseptics is *enough* to prevent blackening of the stools after the ingestion of bismuth subnitrate and enough to cause the disappearance from the urine of aromatic bodies.

Diet

The quantity of food

The Diet in Chronic Nephritis. In feeding patients suffering from chronic nephritis three conditions must be fulfilled. First, the diet must contain qualitatively and quantitatively all that is needed to maintain general nutrition (nutritive equilibrium). Second, the diet must contain as little as possible of materials that in their ultimate passage through the kidneys can irritate the renal epithelia or the glomeruli. Third, the diet, while sparing the kidney function, must not overtax or otherwise injure the function of the digestive or circulatory organs. One may say, in a broad sense, that the daily amount of food, expressed in caloric values should be inversely proportionate to the presumable duration of the nephritis. In acute forms of nephritis, as we have seen, under-feeding or even starvation of the patient not only is permissible, but is good practice; for the smaller the amount of excrementitious bodies the kidneys are forced to eliminate the more they are spared and the more rapidly can they resume their normal functions. The more chronic the nephritis, however, the more nutritive should be the diet, so that patients suffering from this disease should receive daily the full caloric value in their diet that is required to maintain nutritive equilibrium.

The dangers of an exclusive milk diet

For many years it has been fashionable to feed cases of chronic nephritis upon an exclusive milk diet. This method of feeding we owe chiefly to the French school of clinicians and to numerous imitators that this school has educated, including the laity. That milk is a useful article of diet in the management of nephritis, probably the most useful article we possess, no one will gainsay. That a milk diet should be given persistently and should constitute a large proportion of the very efficient means; when these measures become inadequate, artificial intestinal antisepsis is called for. The object of intestinal antisepsis, so-called, is not, therefore, to free the bowel from bacteria, but to prevent the pullulation of certain pathogenic species and to destroy their poisons. Remedies employed to this end may become operative in two ways: They may either act chemically by direct contact, or they may act physiologically by stimulating the natural defenses of the organism to greater activity.

Most of the drugs employed as intestinal antiseptics fulfill both indications, inasmuch as they possess not only germicidal properties, but also act as hepatic stimulants. As the liver cells possess the power of arresting and of disinfecting many bowel poisons, and as the bile is a germicide, any remedy that causes increased activity of the hepatic cells and, by inference, acts as a cholagogue may be considered an intestinal antiseptic of the second variety.

Metallic salts
Bile acids
Organic peroxides

Chief among the remedies recommended as intestinal antiseptics are certain metallic salts, the bile acids and certain organic peroxids. It is necessary, of course, that these remedies when given in doses sufficiently large to check intestinal putrefaction should be non-irritating and non-poisonous. For this reason I prefer the sulphocarbolate of zinc to other metallic salts (mercury, lead, silver, copper), and sodium glycocholate to the free bile acids. A variety of organic peroxids under various trade names are on the market and I consider them useful.

Sulphocarbolate of zinc
Sodium glycocholate

Urinary and fecal evidence of intestinal putrefaction

Intestinal putrefaction may be considered checked when certain bodies that we know to be formed from the putrefactive disintegration of albumin disappear from the feces and from the urine (abnormal degradation products of the fats and carbohydrates play a subordinate rôle in auto-intoxication). Chief among these are a variety of aromatic sulphur compounds and a complex group of substances that also contain the aromatic radicles that are split off from putrefying albumin (compound glycuronates and compound glycocolls).*

For clinical purposes it is sufficient to study the sulphids of the feces and the aromatic sulphates (with indican as their prototype) of the urine.

Dose and administration of intestinal antiseptics

The intestinal antiseptics should be given in small doses (sulphocarbolate of zinc, one-half grain (0.03 gm.); sodium glycocholate, one grain (0.06 gm.); the organic peroxids, one grain (0.06 gm.), at frequent intervals, together with about

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*See Croftan: *Clinical Urinology*, Chapter VII.

the nutritional requirements of the subject. Such amounts of milk contain from one hundred and twenty to one hundred and fifty grammes of proteids, whereas the normal average quantity required by a healthy adult does not exceed eighty grammes per diem; in fact, recent investigations seem to show that adequate nutrition can very well be maintained on very much less albumen. This is particularly the case among individuals whose vitality is low and who, as will be shown presently, should lead a quiet life with the minimum of physical exercise.

Excess of water

Finally, if the patient is fed upon milk alone and if enough milk is given to adequately nourish him, then too much water by far is forced through the cardio-vascular apparatus and the kidneys. The danger of stimulating diuresis by abundant water-drinking in acute nephritis has already been discussed, and attention has been called to the danger of trying to forcibly overcome the resistance that the diseased kidneys offer to the passage of water. In sub-acute forms of nephritis and in those cases that are on the border line between sub-acute and chronic nephritis, the intake of water can be increased; the object being to flush out the kidneys and to rid the kidney canals of accumulated debris. This is a useful practice, because by so doing mechanical obstacles to the flow of urine are removed, and the work of the kidneys is thereby somewhat reduced. If this purpose is to be accomplished, however, it is always better to restrict the liquids for a time and then to institute so-called drinking days, during which very abundant quantities of water are ingested. If this is done the renal canals are flushed and at the same time accumulated waste products are washed from the blood through the kidneys and out of the body. Abundant water-drinking, instituted in this way possibly once or twice a month can do no serious damage, whereas abundant water-drinking continuously practiced undoubtedly injures the gastro-intestinal function, the cardio-vascular apparatus and the kidneys. A warning may incidentally, therefore, be uttered in this place against the indiscriminate use of the many mineral waters that are broadly advertised for the cure of kidney diseases.

Drinking days

Mineral waters

In the Chapter on *Acute Nephritis*, the statement was made that the water intake should be largely governed by the water output. In very chronic forms of nephritis the principle can hardly apply for, especially in the interstitial variety of the disease, large quantities of water are continuously eliminated containing a very small amount of solids in solution. Here, it is an easy matter to produce very copious diuresis by copious water-drinking, but nothing is gained by this and much damage can be done to the heart and arteries which are particularly affected in the latter form of nephritis.

Excess of phosphates

One other objection to the indiscriminate use of an exclusive milk diet may be formulated. It is a well known fact that phosphates are excreted with difficulty when the kidneys are diseased. Milk is very rich in phosphates, and in a healthy individual the urinary phosphorus excretion is greatly increased on an exclusive milk diet. If the kidneys are to be spared, therefore, the urinary phosphate excretion should be reduced and not increased, as is done by feeding milk exclusively. The addition of lime salts to the milk can somewhat obviate this difficulty, so that in nephritis, lime water should always be added to the milk; in this way, calcium phosphate is formed and this salt is absorbed with great difficulty from the intestine; consequently the bulk of the phosphates is excreted in the feces as calcium phosphate and is not at all absorbed into the circulation nor consequently eliminated in the urine. Again, an excess of calcium in the milk leads to the formation of chloride of calcium in the stomach, which is absorbed and combines in part with the circulating phosphates, and the latter, it is well known, are always excreted, presumably through the bile ducts, into the bowel and not through the kidneys into the urine.

Addition of lime water to milk

Disgust and loss of appetite from exclusive milk feeding

There are still other objections to the exclusive milk diet that may be briefly formulated as follows: Aside from the fact that feeding with milk alone, for a long time, becomes thoroughly distasteful and even disgusting to the patients, and that consequently the appetite is lost, and the normal psychic stimulus necessary to perfect digestion is perverted, the ingestion of large amounts of water mechanically does injury to the stomach and intestine; for the stomach becomes dilated and the gastro-intestinal secretion constantly diluted. This, of necessity, impairs the digestive powers of the individual and may lead to a variety of chronic digestive disorders that, as shown above, should be strenuously avoided in chronic nephritis.

Gastric dilatation

All these objections just formulated apply only to the use of excessive quantities of milk in nephritis. If certain precautions are observed in regard to restricting the ingestion of milk to sensible limits, and if the deficit of iron is remedied by the addition of an iron preparation, and if the excess of phosphates is neutralized by the addition of lime water, milk constitutes a valuable food. Broadly speaking, a case of chronic nephritis should receive from one to one and a half litres of milk a day; never any more and preferably less. The milk should be given in divided doses, at frequent intervals, by

How to feed milk

choice in the form of a milk-cream mixture, consisting of four-fifths milk, one-fifth cream and two teaspoonfuls of lime water per tumbler full (nine ounces).

Pancreatin and soda

Inasmuch as the function of the liver is frequently perverted in chronic nephritis, and the character of the intestinal secretion, especially in its upper portions, is consequently changed, it is very useful to give after each ration of milk and cream, a capsule containing pancreatin and soda, to which may be added with advantage the bile acid salts. A gelatine capsule containing the following ingredients may therefore be given four or five times a day:

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Pancreas powder,	2 grains (0.12 gm.)
Sodium bicarbonate,	1 grain (0.06 gm.)
Sodium glychocolate,	½ grain (0.03 gm.)
M.	

As one to one and a half litres of milk contain only about 600 to 900 calories, this amount of food is not adequate to maintain nutrition, consequently it is necessary to make up the caloric deficit by the addition of sufficient proteids, carbohydrates and fats to meet the caloric requirements of the individual. The rules that should govern the arrangement of the diet, as far as the calculation of the caloric values are concerned, have been discussed fully in the Chaper on *Diseases of Metabolism.*

In selecting the kind of albuminous, starchy and fat food to be administered and deciding upon its mode of preparation, the following principles should be observed:

The kind of food and its mode of preparation

Meats

Albumen may be administered in the form of meats, eggs or vegetable albumens. Certain meats should be excluded altogether from the diet, chiefly those that contain extractives and toxic principles. To the former class belong all raw, rare, smoked, cured and corned meats, for they still contain the extractives. Soups, bouillons and meat extracts, as well as most gravies, contain the extractives in solution and should be strictly eliminated from the diet of a chronic nephritic. Internal organs, like liver, spleen, kidney, brain, pancreas contain very abundant nuclein, and as nuclein in process of digestion is split up into the purin bodies, a group of substances that are distinctly toxic and can both irritate the kidneys and the cardio-vascular apparatus, these articles, too, should be excluded. In addition, game, which usually contains ptomaines, especially if it has hung for some time and has "hautgout," is dangerous. Veal is said to be rich in toxic bodies and frequently produces acute digestive disorders, even in well subjects; it ought best, therefore, to be eliminated from the diet. Sea foods of all kinds should be absolutely fresh, and it would be a sensible rule to forbid subjects living far from the seaboard to eat any salt water fish or crustaceans. To the category of forbidden articles also belongs caviar, for it contains a very large amount of nitrogen and an abundance of nuclein, consequently purin bases, and generally some ptomaines.

Sea foods

There has been much discussion in the literature of recent years in regard to the use of light and dark meats. However convincing certain purely scientific researches may be that are intended to show that there is no difference between light and dark meats, I have never been able to convince myself that it is quite safe to depart from the old empiric rule to reduce the ingestion of dark and red in favor of light meats in nephritis.

Light and dark meats

All spices and condiments should be forbidden, for they unquestionably irritate the kidneys.

Spices and condiments

Eggs were, for a long time, tabooed in nephritis; it seems established that raw eggs increase the albuminuria in certain forms of the disease; in view of the fact, moreover, that, especially in all large cities, eggs are generally of the cold-storage variety, and there is consequently always danger of their containing ptomaines, they should be eaten sparingly. There is no objection, however, to the use of two or four fresh eggs a day.

Eggs

Some care should be exercised in the selection of vegetables, thus all vegetables that contain irritating oils or other pungent principles, like radishes, asparagus and garlic, onions, celery should be excluded from the diet. Mushrooms, too, should not be permitted; for, in the first place, they contain a very large percentage of nitrogen for their bulk; and in the second place, as is well known, frequently contain poisonous alkaloids, which, even in small quantities, would be particularly dangerous in nephritis, because their elimination from the body is interfered with. All other vegetables may be eaten with impunity. Preference should be given, on account of their superior nutritive values, to vegetables growing under-ground. Salads, too, are very useful, both on account of the slight laxative properties that they possess, and because they are usually eaten with a dressing containing abundant oil, so that in this way considerable fat can be introduced in a pleasant and palatable form.

Vegetables to be avoided

All articles of food made of flour, rice, cereals, may be eaten with freedom and should be given in abundant quantities, for they enable the ingestion of a sufficient amount of

Starchy foods

Desserts

carbohydrate material and also permit the addition of much fat to the diet in the form of butter or cream. This also solves the problem of desserts, and patients with nephritis can eat puddings, sweets, stewed or fresh fruits, ice cream, etc., with impunity.

Cheese

Cheese is permissible, with the exception of those varieties that contain spices or that are in an advanced stage of putrefaction; thus especially Roquefort, Camembert and Parmesan cheese should be forbidden.

Beverages

Alcohol

Light wines

Cordials and liqueurs

A few rules can be formulated in regard to the beverages that may be permitted a case of chronic nephritis. The amount of liquid permitted has already been discussed above, and the relative advantages of drink restriction and abundant water-drinking explained. Alcohol should be eliminated, as far as possible, from the diet of nephritics, chiefly on account of the effect that this drug has upon the cardio-vascular apparatus; for, as has been repeatedly mentioned, irritation of the heart and arteries and elevation of the blood pressure should be avoided in chronic nephritis. If any alcoholic beverage at all is to be permitted, and this may be necessary among subjects who have been used to a little alcohol all of their lives, then light Moselle or Burgundy or Claret diluted with some alkaline mineral water may be allowed. Cordials, liqueurs and absinthe should be absolutely forbidden, not so much on account of the alcohol, but on account of the essences and flavors (aldehydes, etc.) that all these beverages contain, and that are excessively irritating to the liver and the kidneys.

Beer

Beer is best omitted from the diet of chronic nephritics, especially if they are taking large quantities of milk. Among subjects who have been used to drinking beer all of their lives, the occasional use of a glass of beer can, of course, do no great harm, but it is always safer to forbid it altogether. If beer is to be taken at all, Stout and Porter are better than German beers.

Tea and coffee

Cocoa

Imitation coffee

Lemonade

Tea and coffee are theoretically contra-indicated in chronic nephritis. As the withdrawal of these beverages constitutes a severe hardship, however, to most persons, a little weak tea or coffee thoroughly diluted with milk may be allowed, especially in the morning. One must be governed in the restriction of tea- and coffee-drinking somewhat by the individual tastes and peculiarities of the case. A very useful beverage, and one that can frequently take the place of tea and coffee, is cocoa. Some of the imitation coffees, which are black and sweet and hot, also have a useful place; they certainly can do no harm. Lemonade and orangeade are useful beverages, for the citric acid they contain is converted into carbonate in the body and eliminated as such.

Withdrawal of chlorides

The importance of withdrawing chlorids from the diet may be mentioned in this place. In nephritis the elimination of sodium chlorid (common salt) is often reduced. It is retained in the tissues, and in order to remain there in a solution that equals the molecular concentration of the blood and tissue juices, it must draw water from the blood (the less concentrated solution) into the tissues (the more concentrated solution) by a process of osmosis. This idea may in part explain the edemas of nephritis.

On the basis of this theory the ingestion of sodium chlorid, i. e., common table salt, has been restricted in order to enable the kidneys slowly to eliminate the retained chlorids. If the theory were correct the edemas should disappear.

As a matter of fact, in common with many others I have repeatedly seen nephritic edemas disappear (and, incidentally, albuminuria decrease) when the chlorids were excluded from the food, and reappear when salt was again given.

As one hundred grains of common salt require about three pounds of water to form the proper physiologic solution (i. e., a solution exercising the proper osmostic pressure) in the body, any sudden increase in the weight of a nephritic patient, other things being equal, may mean salt retention and hence water retention (deep edemas), and should be an indication, tentatively at least, to withdraw the chlorids from the food.

Medicamentous treatment

Indications for drugs

The medicamentous treatment of chronic nephritis is of very subordinate importance, for we know of no remedy that can exercise a direct effect upon the nephritic process itself. What remedies are given should be administered in order to prevent constipation and to render the gastro-intestinal tract as nearly aseptic as possible (see index), to exercise an effect upon the heart's action and the blood pressure and symptomatically to relieve dropsy and internal edemas. Most of this drug treatment it will be seen is directed towards improving the condition of the cardio-vascular apparatus; it is in all essentials identical with the treatment described at length in the Chapter on the *Heart and Arteries.* The symptomatic treatment of renal dropsy differs in no way from that of cardiac dropsy (see page 42). Drugs that can be given to relieve symptoms about the stomach, the lungs and the central nervous system are either discussed in the Sections on *Gastro-Intestinal* or *Pulmonary Diseases* or in the Chapter on *Uremia.* It is useless, therefore, to describe all these remedies again in this place.

Necessity of giving drugs sparingly

Drugs should, at all events, be used sparingly in chronic nephritis, for the continuous administration of drugs is always fraught with many inconveniences. In the first place the prolonged use of medicine is bound sooner or later to injure those organs that are concerned with their absorption and elimination, notably, the stomach, the liver and the kidneys; and in addition the effect of most drugs that we might give for the sake of reducing the blood pressure or stimulating catharsis or diaphoresis is exceedingly transitory and the organism soon becomes accustomed to them.

Hydrotherapy

It is much safer to undertake symptomatic treatment by hydro-therapeutic means, for, if the patient has been treated largely by such measures, then he always has drugs to fall back upon in emergencies should alarming symptoms develop that require energetic treatment. And as a rule it will be found that much smaller doses of the different medicines will be required in such cases to produce the desired effect than in patients who have been habituated for long periods of time to the use of cardiac tonics, vaso-dilators, cathartics, diuretics, diaphoretics, etc. This is a great advantage.

Effect on heart's action and blood pressure

Physiology of blood pressure

Hydro-therapy is the most efficient means for influencing the heart's action and the blood pressure. Three elements enter into the physiology of arterial tension, viz., the amount of the blood, the force of the contraction of the heart, and the degree of peripheral resistance. From the heart emanates the force that propels the blood into the arteries and causes the tension of their walls. The peripheral resistance, by creating an obstacle to the evacuation of the arteries, causes an accumulation of the blood in these vessels and tension of their walls with a reactive elastic pressure that propels the blood onward. The mass of blood finally is the intermediary agency that driven from behind and compressed from in front distends the arteries to such a degree that the elastic powers of their walls can become operative. Increased or decreased, these three factors determine variations in the blood pressure, and all three factors can be profoundly influenced by hydriatic measures.

Changes in peripheral resistance

Changes in the peripheral resistance can be brought about both by cold and by hot applications. In chronic arterial diseases the latter, however, should have the preference, for this reason: The application of cold always at first produces a contraction of the peripheral vessels, followed very shortly by a dilatation called "the reaction." This physiological reaction that leads to reduced blood pressure cannot be utilized with safety in most cases of chronic nephritis; (1), because the primary contraction of the peripheral vessels causes a sudden increase of the arterial tension and may, in predisposed subjects, produce rupture of the weakened blood vessel walls in the brain, the retina or otherwise; (2), because the cold causes an increase of the heart's action by a nervous reflex that is transmitted directly to the cardiac ganglia; (3), because, in chronic nephritis, the reaction may fail altogether owing to lack of tone or possibly to anatomic changes in the musculature of the peripheral arteries, or on account of myocardial changes.

Hot hydriatic measures vs. cold

The method of choice, therefore, for reducing the peripheral blood pressure is the application of heat to the body surfaces, for hot applications, provided the degree of temperature is not too high, produce from the beginning cutaneous hyperemia without preceding contraction of the peripheral blood vessels, and if continued, true relaxation of the muscular coats of the peripheral arteries with a corresponding fall in the blood pressure. Moreover, heat causes a long-lasting loss of tone on the part of the peripheral blood vessels, in other words, a prolonged vaso-dilator effect, whereas the reaction following cold applications leads to what may be called a tonic congestion of the peripheral vessels during which the tone of the blood vessels is fully preserved so that contraction soon follows. Heat, furthermore, if applied for a sufficient length of time produces dilatation not only of the cutaneous vessels, but also of the deep blood vessels; whereas, the dilatation of the superficial vessels produced by cold is usually accompanied by intense contraction of the deep vessels, an effect that leads rather to high than to low blood pressure. The fall of blood pressure, therefore, following hot applications is much more permanent and its production fraught with less dangers than the decrease of arterial tension produced by cold or by medicinal vaso-dilators.

Hot baths

The simplest way of applying heat to the surfaces of the body for the purpose of reducing blood pressure is to give the patient what may be called a "hot soak," i. e., the patient is instructed to once or twice a day (for practical purposes best early in the morning and late at night) lie perfectly still for five or ten minutes in a bathtub filled with water a few degrees below the temperature of the body. If it is desired to increase the effect friction may be applied for a time by an attendant while the patient is immersed in the bath.

Salt or carbonic acid baths

The addition of a few pounds of salt to the water, or immersion in warm carbonated water, is very useful because the salt and the carbonic acid both assist in relaxing the peripheral capillaries.

The bathroom

The bathroom should always be kept very warm for the capillaries of the skin are relaxed after the bath and should be kept so as long as possible; if the room is cold sudden contraction of the cutaneous vessels occurs and therewith a rapid rise of blood pressure and an increased strain upon the heart—all effects that one is precisely trying to avoid. In cases, moreover, in which the vaso-motor tone is below par, and this is common in cardio-nephritics, there is always considerable danger of catching cold. The best plan of all is to have the patient lie down in a warmed bed for a time after the bath.

Danger of collateral hyperemia

One other important point must further be considered in using this plan, viz., the occurrence of collateral hyperemia in various parts of the body, especially the brain. For this reason the head should always be covered with cold cloths or an ice bag during all the time the patient is in the water. It will be found that this plan not only reduces the blood pressure for many hours thereafter, but also slows the heart and reduces the force of its contractions. Occasionally the rapidity of the heart action is slightly increased, especially after the patient leaves the bath. In such cases the application of the ice bag to the precordial region, or of cold cloths to the nape of the neck, may be employed to reduce the number of heart beats.

Cold to the head

Effect on volume and composition of the blood

A marked effect can further be exercised by hydro-therapeutic measures upon the composition and the volume of the blood. From all that has been said above, it is clear that cold applications are absolutely contra-indicated in any case of nephritis owing to the sudden initial rise of blood pressure and the nervous shock to the heart that they engender. It is useless, therefore, to discuss in this place the interesting effect that cold applied to the surfaces of the body can exercise upon the percentage of leucocytes and of red corpuscles, and upon the specific gravity and the volume of the blood; and we will concern ourselves therefore exclusively with the use of hot applications in order to see what effects, that may be beneficial in nephritis and that we usually attempt to produce by drugs or diet, can be produced by heat.

Electric light and hot air baths

Dry heat, i. e., the electric light bath or hot air, applied in different ways, always produces a greater concentration, i. e., a decrease in the total volume of the blood. This is due, of course, to the loss of water through the sweat glands, and while this practice by accelerating the current of lymph may act beneficially in the absorption of edemas, I have never been satisfied that sweating produced in this way is beneficial in cases of nephritis without edemas; for while some solids are lost through the sweat glands, the loss of water is immeasurably greater, and the concentration of the blood is so much increased by this practice that whatever toxic bodies may be circulating can undoubtedly exercise a more deleterious effect in a concentrated

Danger of sweating by dry heat

than in a diluted form. The reduction of the blood pressure that might result from a decrease in the volume of blood is offset by the greater toxicity of the circulating fluids, for the pressor principles they contain are not eliminated via the sweat glands. If dry heat is applied, then the patient should at all events at the same time be given very copious draughts of water to compensate for the loss of water by diaphoresis, but as this practice undoubtedly throws a great strain upon the heart and arteries that have to pump this water from the stomach to the emunctories of the body, I have always felt that the benefits accruing from sweating by dry heat are more than neutralized by all these disadvantages.

Copious water drinking during the sweat

Sweating by moist heat

For this reason if sweating is to be produced at all it should be done by means of moist heat, and here the method of choice is without doubt immersion for five, ten or fifteen minutes in water heated slightly above the temperature of the body. It will be found that when this plan is adopted, the concentration of the blood does not increase, as manifested by determinations of its specific gravity, freezing point, and electric conductivity. It is possible, as Wick has suggested, that the loss of water through the sweat glands is compensated by the absorption of water from the tissues, superinduced and aided by the pressure exercised from without by the water of the bath; at all events, immersion in hot water, aside from lowering the blood pressure by prolonged vaso-dilatation, causes a certain loss of excrementitious solids through the sweat glands without causing great concentration of the body fluids, in other words, greater toxicity of the latter, and without consequently necessitating the administration of much water by mouth. If properly carried out immersion in hot water really aids the body in getting rid of both solids and water with safety.

Hydriatic means to allay nervous irritability

In all diseases complicated by high arterial tension and an irregular and excitable heart action, and to this category belong practically all cases of chronic nephritis, it is a matter of great importance to allay the nervous irritability. We should always endeavor to do this psychically by quieting the patient's fear, trying to keep him from worrying about his condition, and advising him not to lead too strenuous a life, and we usually enforce this effect by sedative remedies. Much more can be accomplished in this direction with complete safety by hydro-therapeutic means. This fact is so well-established that nowadays the standard treatment of neurasthenia, and of many psychoses complicated with excitement, consists in the use of hydro-therapeutic means. As a rule it is impossible to carry out such treatment at home. Certain simple measures that are of great

Psychic treatment

value in quieting the sensibility of the whole nervous system, including the vaso-motor nerves, can, however, be carried out in one's house, and chief among these, again, is the use of warm water and, by preference, the prolonged warm bath.

Effect of hydriatic means on the general metabolism

Upon the general metabolism the use of hot water also exercises a very profound influence that is particularly valuable in nephritis. For immersion of the body in hot water for some time, by preventing the loss of heat by radiation, and, incidentally, by causing dilatation of the blood vessels supplying the muscles, causes an acceleration of metabolism, particularly of the non-nitrogenous constituents. This is a valuable effect in nephritis as it prevents to a certain degree the accumulation of waste products in the blood and relieves the kidneys of the necessity of excreting them. In obese subjects a considerable loss of fat can be brought about in this way, especially when judiciously combined with proper exercise treatment, and that this is invaluable in any form of cardio-renal disease need hardly be emphasized.

The use of dry heat is again not safe on account of its effect upon metabolism, because the body at once consumes an increased amount of its own nitrogenous constituents to make up for the loss of heat by radiation; in this way flooding of the blood stream with urea and bodies that are intermediary between albumen and urea is brought about. Whenever this occurs increased labor is thrown upon the kidneys, as they must rid the organism of this circulating waste material.

Effect on digestion

Upon the digestion, i. e., upon the secretory and motor function of the stomach and bowels, hydriatic procedures also exercise a profound influence. Unfortunately, however, the measures that are most efficacious in promoting increased secretion and improved motility are cold hydriatic means, and these we cannot employ. The one cold measure that is useful and that can be applied with safety is the application of cold locally over the liver, either in the form of a Priessnitz compress or by means of a cold stream of water directed against the hepatic region with the rest of the body protected. This process stimulates the hepatic function and promotes an increased flow of bile. In view of the presumably hepatic origin of many forms of Bright's disease (see page 206), this is a useful adjuvant to treatment, especially since the entrance of much bile into the upper portion of the bowel reduces intestinal putrefaction. This is one of the most desirable effects that can be obtained in nephritis, an effect that we usually attempt to bring about by dietetic and medicinal means.

Effect on the flow of urine

In conclusion a word should be said in regard to the effect of hydriatic procedures upon the flow of urine. Cold applied to the surfaces of the body, as is well known, stimulates diuresis both by raising the blood pressure and presumably also by a reflex action upon the musculature and the sensory nervous apparatus of the bladder. This becomes manifest by the almost instantaneous desire to urinate that patients develop as soon as cold measures are applied. As cold is inadvisable in nephritis, we cannot make use of this procedure, but I do not consider this a disadvantage, for I have never been convinced that the stimulation of diuresis is a desideratum in nephritis. Any measure that increases the flow of urine by implication stimulates, even irritates, the kidneys, immaterial whether the stimulus be a drug acting directly upon the secretory mechanism of the kidneys or upon the blood pressure within the kidneys. When the kidneys become diseased they at once fail, as shown above, to eliminate certain bodies properly, but to force them to eliminate, nevertheless, is a precarious procedure for it violates one of the fundamental principles of the treatment of a functionally inadequate organ, viz., that this organ should be rested rather than irritated and forced to work. For rest alone will enable Nature to institute the necessary reparative processes and to hasten recovery. Consequently heat is again useful for it lowers the blood-pressure in the kidneys and consequently may somewhat reduce diuresis, but it also spares the kidneys by soothing rather than irritating the nervous apparatus that superintends the manufacture and excretion of urine.

Signal advantages of proper hydrotherapy in the treatment of chronic nephritis

It will be seen, therefore, that such simple measures as hot bathing, properly administered, and the application of hot or cold to various portions of the body, can accomplish much in the treatment of the nervous, metabolic, gastro-enteric and cardiovascular manifestations of nephritis that we ordinarily attempt by drugs.

Climate and altitude

In selecting a climate its effect upon the skin should be considered, preference should be given to a climate in which the daily temperature fluctuations are very small, in which the altitude is low and the atmosphere dry; for such a climate stimulates insensible perspiration, so that the kidneys are relieved of some of the labor of excreting water; moreover, the surfaces of the body are not alternately heated and chilled, consequently there is less danger of catching cold and less probability of disturbing the vaso-motor equilibrium and hence causing congestion of the diseased kidneys. Otherwise the choice of a resort or a climate should be governed by the condition of the heart and arteries (see page 24). In Europe, chronic nephritics are sent to Egypt, Algiers, Corsica and the Riviera. In the United States, Southern California, Arizona and New Mexico furnish the most ideal locations for this class of cases.

Exercise Massage

The regulation of exercise and the administration of massage likewise are dependent on the state of the cardio-vascular apparatus more than of the kidneys. For a discussion of this part of the treatment I refer, therefore, to the Chapter on *Diseases of the Circulatory Apparatus.*

Surgical treatment of Bright's disease

One word may be said in conclusion concerning the so-called surgical treatment of Bright's disease. Splitting of the kidney capsule, or decapsulation of the organ, for the cure of Bright's disease is altogether irrational. The temporary relief of tension may improve the blood supply to the kidneys, and hence restore, for the time being, some functional activity to diseased epithelia; and this improvement in the renal function may become manifest by a reduction of the edema, by a transitory decrease in the albuminuria, the disappearance of formed elements (casts, etc.) from the urine, and an increase in the excretion of solids and of water. Bright's disease, however, as we have seen in the preceding paragraphs, is a systemic disorder and the nephritis is merely one of its symptoms. Any treatment of the kidneys alone, whether surgical or otherwise, is, therefore, purely symptomatic, and can in no sense be regarded as curative. One might as well amputate the rose-spots in typhoid fever and expect to cure the disease. It is not surprising to find, therefore, that no true case of Bright's disease has even been permanently benefited by operations on the kidneys. The procedure is mentioned in this place merely to be condemned.

II. PYONEPHROSIS AD PYELITIS.

Pyonephrosis and pyelitis are rarely primary disorders. As a rule they are consecutive either to calculus disease, or they develop by ascending infection from some disorder of the lower genito-urinary passages. Occasionally they are blood-borne as, for instance, in tuberculosis, typhoid, pneumonia, scarlet fever, diphtheria and small-pox. Carcinoma and sarcoma, and occasionally syphilis, also produce pyelitis, possibly by weakening the resistance of the tissues and thus rendering them susceptible to infection.

Causal and prophylactic treatment

The causal and prophylactic treatment of pyelitis must take all these pathogenetic elements into consideration. Thus in some cases the same rules apply as in the treatment of nephro-lithiasis, disorders of the bladder, urethra and female genitalia. Treatment directed towards preventing pyelitis in infectious diseases

Counter-irritation over Petit's triangle

Catharsis

consists in promoting a copious diuresis and advancing every effort to reduce the toxicity of the urine and increasing the resisting powers of the renal and pelvic tissues. The inflammation within the renal pelvis can be favorably influenced by the application of leeches or cups over Petit's triangle, i. e., that area which is bounded by the crest of the ilium, the latissimus dorsi and the external abdominal oblique muscles, for the veins of this region connect directly with the veins of the renal capsule, so that counter-irritation, bleeding or cupping over Petit's triangle can exercise an important effect upon congestion within and around the kidney. In addition the bowels should be kept freely open by the use of laxatives, preferably of a vegetable character. In this way revulsive action is promoted and at the same time the absorption of bowel toxins that might be irritating to the kidneys in their passage into the urine prevented.

Diet

The diet should be bland and non-irritating and consist largely of milk. Here the principle of sparing the kidney that is so important in most renal disorders of an acute and sub-acute character, obtains with particular force, for the kidneys must be enabled to put forward every effort towards combating the local inflammation. The diet should consequently be arranged in the same way as outlined under *Acute and Subacute Nephritis*. There is one exception to this rule, viz., cases of pyelitis without nephritis should always drink plenty of water in order to dilute the urine and thus flush the kidney channels and the pelvis, prevent ascending infection and stagnation and mechanically, in case the presence of calculi is suspected, promote their expulsion.

In the latter case, provided it is possible to determine the composition of the concretions from fragments that may be passed or from other urinary signs, the same dietetic rules should be observed as described under *Nephrolithiasis*.

Astringents

In the more chronic varieties astringents, chiefly tannigen, in doses of from ten to thirty grains (0.6 to 2 gm.), or catechu, preferably in the form of the compound catechu powder, containing catechu, kino, krameria, cinnamon and nutmeg, in doses of from ten to seventy grains a day (0.6 to 2.4 gm.) may be given.

Urinary antiseptics

Urotropin

Sodium benzoate

Copaiba

Juniper oil

In this disease, finally, urinary antiseptics have the widest field of application. Best of all is urotropin, which may be given in doses of from three to ten grains (0.2 to 0.6 gm.) in a full glass of water, three or four times a day. Benzoate of soda, in doses of from five to thirty grains (0.3 to 2 gm.) in water; the oil of copaiba, in doses of from ten to fifteen minims (0.6 to 1 cc.) in capsules; the oleum cadinum (empyrheumatic oil of juniper) in the same doses, are all useful.

Finally, salol, in doses of from five to fifteen grains (0.3

Salol
Sod. sulphocarbolate
Methylene blue

to 1 gm.) in capsule or powder or, the sulphocarbolate of sodium in from five to fifteen grain (0.3 to 1 gm.) doses three or four times a day can also be employed. Methylene blue is without effect. All of these remedies should be taken with abundant water and in using any of them great care should be exercised not to produce renal irritation. Their prolonged use is, as a rule, somewhat dangerous, hence the urine should always be carefully examined for casts or other evidence of nephritis. As soon as such signs appear the administration of these drugs should be interrupted or stopped.

Pain

The pain in pyelitis should be treated in the same manner as the pain in nephrolithiasis and renal colic (see page 232).

Surgical treatment

In cases of very severe suppuration that do not yield to medicamentous treatment, combined with the proper diet, hygiene and rest, surgical intervention may become necessary, consisting in drainage of the kidney, removal of concretions that may be present, or even nephrectomy.

Intra-pelvic medication

Of recent years still another method of treating pyelitis has been devised, consisting in the introduction of a ureteral catheter and the injection of various astringents and antiseptics directly into the renal pelvis.

THE TREATMENT OF PYELITIS BY LAVAGE OF THE RENAL PELVIS.

(By Dr. F. Kreissl, Chicago.)

Instruments employed

Technique

Lavage of the renal pelvis is performed by injecting medicated fluids into the pelvis through a ureter-catheter, introduced by means of a cystoscope. The direct or indirect view catheterizing-cystoscope may be employed. In the male the direct view cystoscope no doubt causes more tension and traumatism to the prostatic urethra than the indirect view instrument. The former, also, will be found inadequate where the ureteral os, as quite frequently happens, is located close to the vesical sphincter. On the other hand it will generally be found that the passing of the catheter into the ureter is more readily accomplished with the direct view cystoscope, for here the curve from the instrument to the ureteral os is eliminated. For the purpose in question a cystoscope should be employed which can be removed without disturbing the position of the catheter in the renal pelvis. The catheters used should have moderately blunt points, and should be introduced without undue haste in order to avoid traumatism. Renal lavage, if carried out carefully, and under strictly aseptic precautions in every detail is a harmless procedure.

Solutions employed

The solutions most commonly employed are a warm solution of boric acid, 4 to 100; oxycyanide of mercury, 1 to 4000; nitrate of silver, 1 to 2000 to 1 to 1000; protargol 1 per cent. and argyrol, 5 to 20 per cent. Of the silver solutions mild concentrations should be used at first, gradually increasing their strength from treatment to treatment.

Quantity to be injected

The quantity to be injected must vary with the capacity of the renal pelvis in each individual case; however, so much should never be injected as to cause over-distension and colicky pains. In the majority of cases I have found injections of 4 to 8 cc. at a time sufficient.

Frequency of applications

The intervals that should elapse between each application depend on the nature and the extent of the local trouble. If there is much debris in the renal pelvis it will be necessary to perform preliminary irrigation with a warm boric acid solution until the fluid returns fairly clear, and then to inject the antiseptic; while in cases with little pus in the urine, the antiseptic may be deposited at once without a preceding cleansing irrigation.

Leaving the catheter in place

Where the conditions require daily renal lavage in male patients I always prefer leaving the catheter *in situ* for a few days at least; this permits frequent topical application without unnecessary and inevitable traumatism to the prostatic urethra incident to repeated introduction of the instrument.

Limitations of the method

The extravagant claims which have been made for this method of treatment are not supported by facts, but it certainly has a definite, though limited, sphere of usefulness. To appreciate this the following points may be considered: Etiologically pyelitis, or rather pyelonephritis, is more frequently caused by a descending or hematogenous, than by an ascending or urogenous, infection. If the suppuration be of hematogenous origin, the kidney parenchyma must have been first infected, and it is hard to understand how a topical application to the renal pelvis can effectively reach the focus in the kidney proper. And the same objection must reasonably be made to the efficacy of the method in the ascending type of pyelonephritis. At best one can expect some relief of those symptoms which are due to abnormal conditions in the renal pelvis and are directly traceable to the infection and inflammation existing in that locality as, e. g., retention of pus and urine arising from inflammatory swelling or blocking of the ureteral openings, renal colic from distension of the pelvis and fever.

Suppurative pyelitis

Cases of suppurative pyelitis without involvement of the kidney proper constitute only a small fraction of the cases of pyelitis that come under observation; this is partially explained by the generally accepted fact that hematogenous infection is the more common cause of pyelitis than urogenous infection; perhaps also by the absence or the mildness of perceptible symptoms in initial stages of the disease that render its early discovery rare. This also explains the fact why we do not often see cases before the kidney parenchyma has been invaded.

Complications

Another point to be considered is that many of these cases either are caused by or complicated with calculus, malformations of the renal pelvis, strictures or other obstructions in the ureter and urethra, tuberculosis, tumors, etc., so that renal lavage can, at best, give only temporary relief, while suitable and well directed surgical measures will usually obviate the necessity of any tropical application.

Spontaneous healing of uncomplicated pyelitis

Furthermore, the vast majority of uncomplicated cases of pyelitis heal spontaneously, or under the use of the internal agents discussed in previous paragraphs of this section. Almost the only exceptions to this rule are ascending gonorrheal infections of the renal pelvis. These cases are not so rare as is commonly believed and they do not yield to conservative treatment, while renal lavage with efficient silver solutions has generally given me surprisingly good and rapid results. Frequently, however, especially in older cases the gonococcus appears associated with bacterium coli, staphylococcus and other germs; if properly treated the gonococcus in such cases disappears permanently from the renal pelvis, but I have never succeeded in a single case of this kind in clearing the urine thoroughly or permanently of the other bacteria. This leads me to the conclusion that renal lavage is not effective in mixed infections of the pelvis, or else that the gonococcus has a tendency to locate in the pelvis, while the other germs invade the kidney proper where topical applications do not reach them.

Gonorrheal pyelitis

Renal lavage not effective in mixed infections

Summary

Summing up my experience with renal lavage in many cases of divers types of pyelitis and pyelonephritis, I recommend its use as a curative agent in pyelitis uncomplicated by nephritis, stones or strictures, and then only when the ordinary means of internal medication fail to remove the suppuration.

III. NEPHROLITHIASIS.

Indications for treatment

The treatment of nephrolithiasis must concern itself, first, with preventing the deposit of concretions in cases that are predisposed to the formation of renal stones; second, with facilitating the passage of the concretions after they have once formed; third, with preventing secondary infections and, lastly, with symptomatically relieving the pain, the renal colic, the hematuria and other phenomena.

Prophylaxis

The prophylactic measures that we can employ vary according to the character and the composition of the urine. Thus an individual voiding an acid urine, with occasionally a little gravel or sand composed of uric acid, urate or oxalate crystals, must be treated differently from a subject whose urine is alkaline and possibly purulent; for, in the latter, we have every reason to dread the formation of phosphatic deposits. Of the many concretions that can form in the urinary passages the most important varieties, and those that, alone, in the light of our present knowledge, are amenable to causal and prophylactic treatment, are uric acid and urates, oxalates and phosphates.

NEPHROLITHIASIS URICA.

Four factors that determine solubility of urinary uric acid

To prevent uric acid or urate deposits the solubility of the urinary acid must be increased *ad maximum*. The factors that chiefly* determine this solubility are the concentration of the urine, the percentage of uric acid it contains, its content of sodium chloride and above all its reaction. The more concentrated the urine and the more uric acid and sodium chloride it contains percentically the greater the tendency to the precipitation of uric acid and urates in the urinary passages.

Diet

For these reasons the urine should always be rendered dilute by abundant ingestion of water; the urinary excretion of uric acid should be reduced as much as possible by proper dietetic and medicinal means, as described in full in the Chapter on *Diseases of Metabolism* (page 177), and, finally, the intake of sodium chloride, i. e., of common table salt, should be restricted.

Alkalies

The most important element in the prophylactic treatment of nephrolithiasis urica, however, is the regulation of the reaction of the urine, for it is a well established fact that the alkaline urates are more soluble than acid urates or uric acid itself. To render the urine less acid and to promote the solubility of uric acid, alkalies, i. e., chiefly sodium carbonate and bicarbonate, or alkaline mineral waters, are commonly given in nephrolithiasis urica. It must be remembered, however, that the action of alkalies in cold urine, or even in normal urine, as studied in the test tube, differs materially from their effect on a highly concentrated urine, such as we find it in nephrolithiasis urica, in which the gravel deposits at body temperature. The changes in

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*In all forms of nephrolithiasis there must also be a cementing material (mucus fibrin, pigments, etc.) that makes a *concretion* out of a fine *sediment*.

the reaction of the urine, moreover, that are seen after the administration of alkalies must be interpreted with great care if urinary titration methods are employed, for here many sources of error creep in that need not however be discussed in this place.

Effect of alkalies on proportion of different urinary phosphates

The most important influence undoubtedly exercised by the administration of alkalies upon the solubility of uric acid in the urine is the change in the relative proportion of acid, neutral and basic phosphates in the urine that they bring about. For uric acid is readily soluble in basic phosphates (di-sodium phosphate), but insoluble in acid phosphates (mono-sodium phosphates); the addition, in fact, of mono-sodium phosphate to a solution of uric acid in di-sodium phosphate will cause the precipitation of uric acid. It is clear, therefore, that the solubility of uric acid in the urine is enhanced by the presence of di-sodium phosphate, and that the tendency to the formation of uric acid concretions increases in proportion to the amount of acid phosphate that is excreted through the kidneys. It is also clear that any effort directed towards preventing the precipitation of uric acid in the urinary passages must be concerned with increasing the amount of basic, and decreasing the amount of acid, phosphates. The ideal would be to cause the complete disappearance from the urine of mono-phosphate and, at the same time, to produce an elimination through the kidneys of a quantity of di-phosphate sufficiently large to hold all the uric acid excreted in solution. This can be accomplished in two ways, viz., either by decreasing the phosphoric acid in the blood that enters the kidneys or by increasing the sodium in this blood. The latter object can be accomplished by sodium salts but better still, as will be presently shown, by calcium salts.

The decrease of phosphoric acid in the urine

To decrease the phosphoric acid its source must be considered; it may be derived from preformed phosphates ingested with the food or from the phosphorus contained in the albumins (chiefly nucleins) of the food or the body tissues proper that is converted, by intra-cellular oxidation, into phosphoric acid. By eliminating from the diet, on the one hand, pabulum containing preformed phosphates or nuclein-containing food, and by removing, on the other hand, from the blood and tissues, through other channels than the kidneys, the phosphoric acid that must inevitably be formed from the degradation of our own tissues, we can reduce the urinary phosphate excretion.

Calcium as a remedy

We possess a remedy that can both directly and indirectly regulate the phosphoric acid content of the blood and hence of the urine, viz., calcium salts.* For, in the first place, calcium

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*Croftan: The Use of Calcium Salts in Nephrolithiasis, etc. *Jour. A. M. A.*, 1904.

*See Croftan: "*Clinical Urinology.*"

forms insoluble salts with the alkaline phosphates contained in our normal food, and in this way prevents the absorption of this moiety into the blood. In the second place calcium, owing to the great affinity it possesses for phosphoric acid, combines with the phosphoric acid encountered in the blood stream, and causes the elimination of this proportion in the form of calcium phosphate—not, however, through the kidneys, but in great part through the intestine. This is an important point, for, in contradistinction to sodium, potassium and magnesium, all elements that are chiefly eliminated through the kidneys, calcium is principally (85 to 95 per cent.) eliminated through the bowel.

Mode of action of calcium salts

It will be seen, therefore, that calcium given by mouth can, first, prevent the entrance of a certain proportion of preformed phosphoric acid (phosphates) from the food into the blood, and can, secondly, prevent some of the phosphoric acid formed in the organism from passing into the urine by causing its elimination through the intestine.

Dangers of continued alkali therapy

Advantages of calcium salts

In order to increase the sodium (or potassium) in the renal blood, sodium (or potassium) salts, as stated above, are commonly administered; but this practice is not without its dangers, for it may produce alkalinization of the urine and therewith create a tendency to the formation of phosphatic deposits (see below) upon the uric acid or urate stones. When this occurs the concretions usually grow rapidly and more harm is done than good. Whenever an alkali therapy is employed, therefore, care should be taken above all things to keep the urine faintly acid. This is difficult when sodium (or potassium) salts are given for long periods of time; their continued use, moreover, exercises a deleterious effect upon the gastric digestion and is not without effect upon the corpuscular elements of the blood. Calcium salts, on the other hand, never render the urine alkaline and are fully as efficacious as sodium or potassium salts for they, as shown above, cause a *relative* increase of the sodium and potassium and hence of the sodium (potassium) di-phosphate of the urine. They are, therefore, the best prophylactic remedies in nephrolithiasis, either alone or in combination with small quantities of sodium carbonate and, above all, with plenty of water.

Dose and administration of calcium salts

The best calcium preparation is the carbonate. This may be given in doses of fifteen to twenty grains, three times a day. More may be given with impunity. It is necessary to individualize. The smallest efficient quantity of any drug is always the best dose. The urinary calcium, phosphorus and uric acid excretion can to advantage be determined in the beginning (the patient being on a fairly constant nuclein-free diet) and the dosage regulated accordingly.

Mineral waters containing calcium

A more convenient method of administering calcium, and one that is preferred by most patients, particularly if the treatment is to be carried out indefinitely, is to give calcium in the form of natural mineral waters or as an addition to some pure water. Among the better known European mineral waters Contrexéville, Wildungen and Fachingen contain the largest proportion of calcium salts. Among domestic waters the choice is difficult. The exploiters of the majority of them make such blatant and extravagant claims in regard to wonder cures that it is not safe to place any reliance on this essentially commercial propoganda. Personally, I prefer adding the necessary amount of calcium salt or lime water to some pure water.

Uric acid solvents

A word may be said in this connection in regard to certain other remedies that have been recommended from time to time as so-called uric acid solvents. In most cases these remedies are given because they possess the property of dissolving uric acid in the test tube. One is not justified in deducing from this fact that they can also dissolve uric acid in the body, especially after urates have crystallized out or concretions have once formed.

This applies with particular force to the alkalies that have just been discussed. They do not possess the power of dissolving urate concretions in the renal passages or otherwise in the body, but they act prophylactically by increasing the solubility of the circulating acid and preventing its deposit. They may also act beneficially by promoting general oxidation, and they finally possess a certain diuretic effect which is useful.

Fallacy of giving uric acid solvents

It is preposterous to give alkalies or any other remedies with the idea that they will dissolve urate concretions. One might as well give ether to dissolve the fat of the body in obesity, or mineral acid to dissolve the calcium out of osteophytes, on the ground that ether or acids can dissolve fat or calcium salts in the test tube. The amount of ingested alkali, moreover, that actually reaches the uric acid deposits (which are usually covered with a thin layer of mucoid material that protects them from "solvents") is so small that a solvent effect can impossibly be accomplished.

Lithium

This criticism applies with particular emphasis to lithium preparations that are so popular in the treatment of uric acid diseases. In the first place so-called lithia waters contain only a few decigrammes of lithium carbonate to the litre. As they always also contain large quantities of other alkalies only a very minimal amount of uric acid (according to Barthollet's law) would at best combine with the lithia, the bulk with the sodium and potassium salts, while, at the same time, most of the lithium would be promptly excreted as chloride, phosphate and sulphate. Finally, lithium carbonate, which actually does readily dissolve uric acid in the test tube, is immediately converted in the stomach into lithium chloride, a salt that possesses only slight uric acid dissolving properties.

Lysidin, sidonal, piperazin

Urea

Sodium benzoate

Other preparations that have been recommended as uric acid solvents are lysidin and sidonal (the quinic acid salt of piperazin). I have never been able to convince myself that either of these remedies exercise any solvent effect whatsoever in nephrolithiasis urica. Urea too is considered a uric acid solvent, and it actually possesses the power to a very marked degree of dissolving uric acid outside of the body. Clinically, however, the results obtained from the administration of large amounts of urea have been, on the whole, unsatisfactory. What beneficial effect it occasionally exercises in ridding the renal passages of small concretions must presumably be attributed to its marked diuretic action. Benzoic acid in the form of sodium benzoate, in doses of five to thirty grains (0.3 to 2 gm.) in water has been extensively used. It does not dissolve urate concretions, but it acts as a urinary antiseptic and hence may prevent infection of the urinary passages, with disagreeable secondary consequences like pyelitis. Other urinary antiseptics have been discussed in the part on *Pyelitis.*

Urotropin

Urotropin (hexamethylentetramine) is probably the only remedy that in a measure has vindicated its claim to being a uric acid solvent in nephrolithiasis. It splits off formaldehyde in the body and the latter combines with uric acid to form a soluble compound. It has also been shown that the urine of patients who have taken large doses of urotropin acquires the power to a marked degree of dissolving uric acid. Urotropin is, besides, a very effective urinary antiseptic, so that it truly deserves extended trial in nephrolithiasis urica. It should be given in five to ten grain doses, in a full glass of water, two or three times a day.

Glycerin

One of the most useful remedies to promote the expulsion of concretions that we possess, aside from diuretics and abundant water-drinking, is glycerin. It should be given in large doses of 50 to 100 cc., in lemonade or water. Its mode of action is not well understood, but symptomatically it certainly sometimes aids in the expulsion of small concretions. The urine should, however, always be carefully examined for evidence of renal irritation, for in certain subjects glycerin produces hematuria; so that as soon as blood appears in the urine, the administration of glycerine should be stopped. **Olive oil** Olive oil, too, has been used for this purpose.

The relief of renal pain

For relieving the pain in nephrolithiasis either heat or cold or counter-irritants may be applied to the lumbar region. **Heat and cold** In the dull pain that is so characteristic of a large stone, heat is usually more grateful than cold, whereas in the acute paroxysm of pain in renal colic, cold usually affords greater relief than heat.

Local applications of turpentine and belladonna

Turpentine or tincture of belladonna (a few drops on flannel wrung out of hot water) applied locally in the lumbar region help the dull ache, but exercise no effect upon the colic.

Opium

In severe renal colic opium will usually have to be given, either hypodermically as morphine, in doses of one-fourth to one-half grains, or by rectum in the form of a suppository or a starch enema. **Chloral hydrate** Chloral hydrate, ten to twenty grains (0.6 to 1.2 gm.) by rectum, also frequently relieves. The patient can to advantage also be placed into a warm bath or into bed with hot water bags to the lumbar region. **Chloroform** If these simple measures fail to bring relief, then a few whiffs of chloroform will occasionally not only stop the colicky pain, but actually facilitate the passage of the calculus by producing relaxation of muscular spasm.

Renal hemorrhage

Renal hemorrhages, if slight, should be treated by rest in bed, while the bowels are thoroughly evacuated and the patient is kept on a milk diet. At the same time certain drugs may be given, especially if the hemorrhage becomes obstinate and very severe. **Ergot** The most useful drugs are the fluid extract of ergot in fifteen to thirty drops (1.0 to 2.0 gm.), or preferably the injection of ergot hypodermically, using ergotin, one part, and camphor water, two parts, in doses of three to ten drops (0.15 to 0.65 gm). **Erigeron** The oil of erigeron, fifteen to thirty drops (1.0 to 2.0 gm.) in capsule may be used if there is no nephritis. **Tannigen** Tannigen, ten to thirty grains (0.6 to 2.0 gm.) in powder; the fluid extract of hydrastis, fifteen to sixty minims (1 to 4 cc.), or better the hydrochlorate of hydrastinin, **Hydrastis** given hypodermically or by mouth, in doses of one-half to two grains (0.03 to 0.1 gm.) repeated, are all useful remedies.

Surgery

In case the medicamentous and dietetic measures, combined with rest, fail to stop the pain and hemorrhage; if the attacks of renal colic persist or if severe suppurative pyelitis complicates the disorder; or, finally, if a calculus becomes impacted in a ureter so that the patient's life is endangered from mechanical anuria, then recourse must be had to surgical means.

NEPHROLITHIASIS OXALURICA.

Relation of oxalic acid to uric acid and dextrose

Uric acid and oxalic acid are chemically closely related. There is also a peculiar relationship between dextrose and oxalic acid that is not altogether understood; clinically we know, at all events, that many cases of mild diabetes develop oxaluria and, chemically, we know that dextrose can be converted into oxalic acid.

Diet

The diet consequently should be arranged in such a way as to take into consideration both the factors that may determine increased uric acid secretion and glycosuria. Besides all articles of diet should be excluded from the bill of fare, or greatly reduced, that contain preformed oxalic acid. Chief among the latter are tea, cocoa, spinach, gooseberries, rhubarb, figs and pepper; in addition, coffee, chocolate, chicory, red beets and tomatoes, the last named articles, however, containing only very small quantities. Champagne and beer also seem to lead to an increased oxalic acid excretion. In cases, moreover, that show a decided tendency to oxalate deposits, sugar, sweets, cereals, vegetables growing underground, and all starchy foods should be reduced.

Articles of food containing oxalic acid

Special articles of diet

Meat (with the exception of nuclein-containing organs, i. e., raw, rare and cured meats, meat extracts and bouillons), eggs, green vegetables, salads, plenty of milk and fat, in any form, should constitute the chief articles of diet. In addition much water should be taken, preferably between meals, on rising and on retiring. The addition of a little soda to the water, or drinking alkaline mineral waters, is a useful adjuvant to the treatment.

Abundant water drinking

Nervous dyspepsia and oxaluria

As many cases of nervous dyspepsia, chiefly hyper-acidity of the stomach, seem to develop oxaluria, particular attention should always be paid to this condition according to the rules that are discussed in another chapter.

Symptomatic treatment

The symptomatic treatment of oxaluria is the same as that previously discussed under the heading of *Nephrolithiasis Urica.*

NEPHROLITHIASIS PHOSPHATICA.

Etiological treatment

Phosphate concretions occur only when the urine is alkaline. As a rule they form upon a pre-existing urate or oxalate calculus, or upon some organic débris in the kidneys, the pelvis, the ureters or the bladder. Phosphate concretions are consequently most commonly found in inflammatory, purulent disorders of the urinary passages, particularly if there is some stagnation of urine. Treatment, especially in this form of nephrolithiasis, should hence be directed principally towards rendering the urine aseptic, towards preventing its stagnation and towards combating the existence of pyelitis or cystitis, according to the methods spoken of in appropriate sections. Phosphate stones cannot be dissolved by any known means after they have once formed.

Diabetes phosphaticus

There is also an indistinct metabolic perversion which leads to an increased excretion of phosphorus, so-called *Diabetes Phosphaticus,* in which basic phosphates are excreted in great excess. This, in the obscurity of our present knowledge, we are unable to influence.

Muriatic acid

Phosphoric acid

An attempt should always be made in phosphate lithiasis to render the urine less alkaline and this can best be done by administering by mouth muriatic acid (Acid Hydrochlor. dil.—dose five to thirty drops in water t. i. d.), or, paradoxical as it may sound, phosphoric acid (Acid Phos. dil.—dose five to twenty drops, twice or three times a day in water).

Symptomatic treatment

The symptomatic treatment of pain, colic, hemorrhage, etc., and the indications for surgical intervention are the same as in other forms of nephrolithiasis.

IV. FLOATING KIDNEY.

Causes

Unless the dislocation of the kidney is due to trauma or spinal curvature, abnormal motility and abnormal location of the organ are generally a part symptom of a general gastro- and enteroptosis. Floating kidney is found much more frequently in women than in men. This is due to a number of causes; the wearing of corsets and tight waistbands; pregnancy with resulting sudden changes in the intra-abdominal pressure; dislocation of the uterus and its adnexa exercising a direct pull by continuity upon the ureters and kidneys. The right kidney is more frequently dislocated than the left, both in men and women, first, because it is normally somewhat more motile than the left; second, because the left renal artery is shorter than the right and is more intimately connected by the suprarenal vein with the suprarenal gland than on the right side; third, because the pancreas gives some support on the left side, and, fourth, for the reason that tight lacing is more apt to loosen the right than the left kidney, as on the right side the solid and unyielding liver lies between the waist and the kidney, whereas on the left side the hollow stomach forms a yielding and elastic cushion that does not transmit the pressure exercised from above.

Interpretation of the symptoms of floating kidney

In the great majority of cases the increased motility of the kidney *per se* makes no symptoms. In some of the cases the general gastro- and enteroptosis may produce a variety of distressing phenomena that are often, though falsely, attributed to the floating kidney. In still other cases, and these form the majority, a general neurasthenic state exists, either altogether independent of the abdominal conditions or possibly remotely dependent upon the digestive disorders and the abnormal traction or pressure on the nerve plexuses that the abnormal position of the various abdominal viscera, including the kidneys, produces.

Therapeutic indications

From a therapeutic standpoint slight degrees of floating kidney are a negligable quantity; whatever treatment may be directed towards the general symptoms of the patient should be directed more against the abdominal ptosis than against the floating kidney as such. Whenever symptoms are produced, however, that are directly traceable either to a tugging of the kidney on its attachment, or to twisting of the pedicle of the kidney, with resulting congestion of the organ and possible hydronephrosis and pain, then special treatment of floating kidney becomes necessary.

The remedy must be mechanical

In view of the mechanical conditions existing the remedy must needs also be mechanical and directed towards causing a restitution of the kidney to its normal position and holding it there. Occasionally rest in bed in a recumbent position for weeks at a time, especially combined with a Weir Mitchell fattening treatment (see index) may lead to an increase of the abdominal fat and hence furnish a support for the movable kidney. There is no evidence to show that this plan leads to the formation of a new fatty capsule around the kidney, nor is there for all that any proof that in floating kidney the fatty capsule is lost. The plan is particularly useful however in thin, neurotic women, both because in these cases the increase of the abdominal fat and the resulting greater tension of the abdominal walls really supports the kidneys in conjunction with the other abdominal viscera, and because the rest-cure and the over-feeding act beneficially towards restoring nervous equilibrium. The result is that these patients frequently arise from the rest and "Mast" cure with a kidney that is still somewhat motile but with a nervous system whose tone is restored to such an extent that it is no longer irritated by the abnormal excursions that the kidney occasionally undertakes.

Rest and fattening cure

Results of rest cure

The use of pads and bandages is rarely of lasting benefit in the treatment of floating kidney and is generally disagreeable to the patients. If any support is to be applied at all it should be a general abdominal supporter intended to hold up all the abdominal viscera, possibly with a pad or pelotte, besides, below the kidney region. When this is done, the disagreeable symptoms that are attributed to the floating kidney, but that in reality, as

Pads and bandages

General abdominal supporter

stated above, usually arise from the general abdominal ptosis, are frequently relieved.

Constipation and gastric distension to be combated

Care should always be taken that constipation, over-loading of the stomach and congestion of the liver are carefully counteracted by proper dietetic and medicinal means; for when this is done, the weight of the abdominal organs is reduced and less dragging permitted. The clothing should properly be worn suspended from the shoulders and not fastened about the waist. Lacing, of course, should be forbidden.

The clothing

Indications for surgical treatment

If the degree of dislocation is so severe that the kidney occasionally becomes twisted, with resulting hydro-nephrosis and congestion of the organ with urinary signs that point to degeneration and functional disturbances in the renal epithelia, or if the kidney becomes very sensitive to pressure or hurts spontaneously, then, after all the other means have been tried, surgical intervention becomes justifiable; but not before.

There is unfortunately, nowadays, an exaggerated tendency to operate upon the floating kidney in cases of general abdominal ptosis; and while the operation rarely does any harm in this condition, and may occasionally even do good through the benefits derived from enforced post-operative rest in bed and proper feeding, still, a cure by surgery should never be promised nor the operation advised unless symptoms directly attributable to the kidney become unbearable, or unless nephritic changes in the dislocated organ make their appearance. A description of the operative technique lies without the limits of this article. In most cases a simple nephrorrhaphy is the operation of choice.

Relief of acute symptoms

The acute symptoms produced by twisting of the renal pedicle must be relieved by hot applications and morphine, with rest in bed, while attempts are made at the same time to correct the temporary dislocations of the organ by manipulation, if necessary under an anesthetic.

V. UREMIA.

Critique of current uremia theories

In order to properly treat uremia it is essential to have a clear understanding of the causes that determine pre-uremic states and the uremic attack, or, as one might also express it, chronic and acute uremia. Uremia is commonly considered to be due exclusively to inadequacy of the renal function, with resulting retention of excrementitious urinary bodies. If this current belief were correct, then complete anuria should always produce uremia, and the blood of uremic patients should always show an increase, and the urine a corresponding decrease, of urinary substances.

As a matter of fact, many cases of complete anuria, due to various causes, are recorded, in some instances persisting for several weeks, in which none of the characteristic phenomena of uremia developed. On the other hand, uremia not unfrequently occurs when the flow of urine is abundant and the excretion of urinary solids and water does not appreciably deviate from the normal. Similar results are seen in animals after experimental nephrectomy or occlusion of both ureters, or after the injection of urine. The animals die, but are not uremic.

Anuria does not always produce uremia

One must, therefore, distinguish, clinically at least, between uremia and urinemia. In uremia we witness the signs of urinemia but also other signs besides. The latter, precisely, are the most characteristic symptoms of uremia and never occur in urinemia. This alone forces one to the conclusion that they must be produced by other factors than simple urine poisoning, a contention that is borne out by an analytical study of the blood and urine in uremia.

Uremia and urinemia

Without going into the analytic data in detail the statement may be made that quite as many cases of uremia develop without as with an abnormal amount of nitrogenous or saline constituents in the blood. There also is much chemical and clinical evidence to show that in uremia the general metabolism and, in particular, the manifold functions of the liver, are perverted. Moreover we not infrequently encounter a condition of acidosis that points to a severe auto-intoxication that cannot be attributed to renal inadequacy alone.*

Metabolic disorder

Acidosis

That the kidneys are not always primarily involved is further borne out by the clinical observation of an occasional case of uremia in which the kidneys are found practically normal after death, and in which essentially no evidence of renal disease, or even of functional inadequacy on the part of the kidneys, presented itself during the life of the patient.

The kidneys not always primarily involved

This newer conception of uremia must induce us to depart from the orthodox method of treating uremia.

We are wont to treat uremia by promoting vicarious elimination, i. e., by stimulating the flow of urine, by purging and by sweating, with the intention of relieving the kidneys of the work of excreting retained urinary bodies. Occasionally we even attempt to force these bodies through the damaged kidneys by using diuretic drugs. In addition, we try to regulate the diet in such a way that there shall accumulate in the blood the smallest possible amount of residual excrementitious bodies. If,

The orthodox treatment of uremia and its fallacies

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*For the details, see Croftan, "An Analytic Study of Uremia." *Jour. A. M. A.*, January 6, 1906.

now, uremia is not due to the circulation in excess of such bodies. nor to renal inadequacy alone, then the above treatment is wrongly directed.

Prophylaxis of uremic attacks

The chief object in chronic uremia, i. e., in pre-uremic states, should be to prevent the development of uremic attacks, i. e., of acute uremia, by giving attention to those organs whose functions threaten to fail; and in order to do this intelligently the renal idea should be somewhat relegated to the background and more attention should be bestowed upon the liver and the general metabolism.

The diet in chronic uremia

In chronic uremia the diet should be arranged in such a way that the function of the liver is not overtaxed; at the same time the existence of a chronic nephritis should be included in the calculation. A diet consisting largely of milk and carbohydrate foods is the ideal. In view of the chronic character of the disorder care must, however, above all things, be taken that adequate nutrition is maintained, and for this reason the addition of some albuminous food, preferably in the form of vegetable albumens, is very desirable. Carbohydrates possess a high nutritive value, and at the same time exercise a gentle stimulating effect upon the functions of the liver, without, coincidently, leading to the formation of end-products that irritate the kidneys in their passage. Alkaline waters are also very useful in this condition, for they too gently stimulate the liver, and, above all things, counteract the tendency to acidosis which not infrequently appears in chronic uremia, as manifested by the increased ammonia excretion in the urine. Calcium carbonate, in fifteen grain doses three or four times a day, in powder or capsule, is a useful means to aid in maintaining alkalinity.

Carbohydrates

Alkaline waters and alkalies

Hepatic stimulants

Calomel

The use of hepatic stimulants is also indicated, although great care should be exercised not to give remedies that can irritate rather than stimulate the liver; thus calomel I consider a dangerous drug in chronic uremia. Bile acids, preferably in the form of sodium glycocholate, in doses of one-fourth to one-half grains (0.0015 to 0.003 gm.), together with five to ten grains (0.3 to 0.6 gm.) of sodium carbonate, half an hour after eating, are useful. They possess a distinct cholagogue action and also act as intestinal antiseptics. Salicylates, preferably in the form of salol, in one grain (0.006 gm.) doses, together with an alkali, three or four times a day, half hour after eating, act similarly and are also useful.

Bile acid salts

Salol

Warm bathing

In chronic uremia warm bathing is an excellent preventative measure. The patient should be instructed to lie quietly, for five or ten minutes, in a tub of water slightly below the body temperature, with a cold cloth applied to the head to prevent reactive hyperemia of the brain. Such a bath should be given every evening and may, to advantage, be followed by an alcohol rub, care being taken that the bath-room is warm and the patient does not take cold. This measure is very effective in reducing the blood pressure and in preventing acute uremia. If threatening cerebral signs of uremia appear, a hot bath, combined with friction of the surfaces of the body, is a useful means for aborting convulsions, and the patient, in uremic coma, may safely be placed in a hot bath while cold water is poured upon the head, provided the other means described below for combating acute uremic seizures are instituted at the same time.

Symptomatic treatment

Gastro-intestinal symptoms

Heart symptoms

Cerebro-spinal uremia

Chronic uremia principally manifests itself in a protean array of symptoms involving nearly every organ of the body. While every endeavor is being put forward to treat the conditions that underlie uremia, it becomes necessary in addition to institute symptomatic treatment for the relief of disagreeable subjective symptoms. In view of the fact that, in uremia, Nature puts forward every effort to promote vicarious elimination of accumulating toxins through the different emunctories of the body, disagreeable symptoms about these organs, that are due largely to their irritation by the poisonous bodies that are clamoring for elimination, occasionally require special treatment. Thus vomiting and diarrhea are very common symptoms in chronic uremia. In addition the heart is very frequently overstimulated and ultimately becomes fatigued, so that failure of the heart muscle makes its appearance with edema and stasis; these phenomena, too, occasionally require special treatment. Finally, cerebro-spinal uremia, of a chronic type, occasionally appears, presumably due either to edema of the central nervous tissues or to irritation of these nerve elements by circulating toxins that have a selective affinity for certain nervous tissues. The symptomatic treatment of these various uremic phenomena may now be discussed seriatim.

Vomiting

When to check vomiting

Oxalate of cerium

Vomiting in uremia must, as a rule be regarded as an endeavor on the part of the organism to rid itself of circulating poisons by way of vicarious emesis, and it is questionable whether it is good practice to check this vomiting at once. Vomiting may occasionally even be stimulated to advantage by giving the patients lukewarm water to drink. Only when the vomiting becomes so severe that the patients cannot retain any food, or if the heart and arteries, and, in particular, the cerebral vessels threaten to become seriously over-strained, or if the patients cannot sleep, should we actively interfere by giving symptomatic relief. For this purpose, we can use oxalate of cerium, in doses of from two to ten grains (0.1 to 0.6 gm.), frequently repeated.

Tincture of iodine
Chloroform
Cocaine
Ice
Lavage

This remedy acts like bismuth, but is less toxic and frequently stops the nausea and vomiting. Or the patient may be given from one to three drops of the tincture of iodine in ice cold water or in a few ounces of cold milk. Chloroform, in doses of from five to ten drops, or a dilute solution of cocaine as described elsewhere, may also be given to advantage. If none of these means is efficacious, then the swallowing of small pieces of ice and the application of cold over the epigastric region may occasionally stop vomiting, and sometimes, in extreme cases, lavage of the stomach leads to the goal.

Diarrhea
Saline laxatives
Opium
Tannin

Uremic diarrhea, which is often troublesome, should always at first, be encouraged; that is, a complete evacuation of the gastro-intestinal tract should be promoted by the administration of saline laxatives, for here we must again assume that the organism is trying to get rid of irritating poisons by the bowel path. Saline laxatives are also advantageous in cases of uremia with failing heart and venous stasis and edema of the bowel wall, for the withdrawal of water from the edematous tissues by the saline acts beneficially. If the diarrhea persists so long that the nutrition of the patient is interfered with, then attempts should be made to check the bowel movement by the use of opium or tannin; the former given, preferably, as laudanum, either by mouth, in doses of from five to fifteen drops, repeated every hour or so until the desired effect is produced, or by rectum in thirty to sixty minim doses, preferably in starch enema and also repeated. Tannin is probably best given as tannigen (diacetyltannin), in doses of ten to twenty grains (0.6 to 1.3 gm.) repeated until effect.

Cardio-tonic medication
Edema
Pulmonary edema
Atropine

The heart is usually seriously affected in uremia, and cardio-tonic medication, as described in the Chapter on *Heart Diseases*, becomes necessary. Uremic edemas in various parts of the body are often due to cardiac failure and they should be treated primarily by cardio-tonic medication (see index). One of the most dangerous forms is edema of the respiratory tract, viz., pulmonary edema and edema of the glottis. Here very active measures must at once be instituted if the life of the patient is to be saved, and energetic sweating and purging becomes necessary, even occasionally stimulation of diuresis with the main object in view, irrespective of anything else, of ridding the organism as rapidly as possible of the accumulated water. Atropine in doses of one one-hundredth to one one-hundred-and-fiftieth of a grain hypodermically, may be administered if the patient threatens to drown in his own secretions. In edema of the glottis, ice applied to the neck and ice swallowed are useful. If necessary, scarification of the edematous laryngeal folds or even tracheotomy may be resorted to. In pulmonary edema cold or mustard plasters to the chest also occasionally relieve.

Uremic asthma

Ether

Valerian
Oxygen
Chloroform

Uremic asthma is best treated by the use of ether given as spirits of ether, in doses of ten to thirty drops several times a day; or in the form of pure ether, hypodermically, in doses of 1 to 2 cc., or by mouth, in teaspoonful doses, three or four times during the twenty-four hours. If this treatment, which incidentally stimulates profuse diuresis, does not relieve the asthmatic seizure, then tincture of valerian, in doses of one to three drachms (5 to 10 cc.), oxygen inhalation, or a few whiffs of chloroform must be tried.

Vicarious elimination

Stimulation of salivary glands

As stated above it sometimes becomes necesary in chronic uremia to stimulate vicarious elimination with the expectation that together with much water some toxic material may also be eliminated, and in this way a purification of the blood and tissue juices be brought about. A very useful measure is to stimulate the action of the salivary glands, and a case of chronic uremia should be advised to chew gum. For the sake of producing catharsis, very mild laxatives or dilute laxative water should be used, remembering always that no drug that can irritate the liver should be used, for this organ, as we indicated above, is commonly involved in the chronic uremic self-intoxication.

Sweating

Sweating,* if advised at all, should always be combined with water-drinking or the use of large, water enemas; for unless this is done a concentration of the body fluids will be brought about and the intoxication be rendered more severe. An acute uremic attack, in fact, may be produced by injudicious sweating, particularly as the blood, when it becomes concentrated by sweating without the simultaneous introduction of water, draws abundant toxic material from the edematous tissues in which the toxins are deposited and carries the poisons in a concentrated form to the higher nervous centres.

Diuresis

Diuresis is best stimulated by digitalis combined to advantage with caffein (see formula, page 43), by the copious ingestion of hot water, preferably slightly alkaline, and by large alkaline—saline enemas.

The treatment of the acute uremic attack

The treatment of the acute uremic attack is always an ungrateful task, for immaterial whether we are dealing with a disorder that is primarily or in its ultimate consequences due to renal, hepatic or general metabolic insufficiency, we are in most cases concerned with a syndrome that is due to the crumbling of the whole cellular edifice. To arrest this collapse essentially means to revive a dying organism. That this may occasionally be done, for the time being, cannot be denied; and as the recuperative powers of the human body border on the phenomenal no effort should be spared to bring an acutely uremic patient back to life.

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*See page 237.

The acute attack usually sets in with fulminating symptoms simulating epileptic seizure (uremic eclampsia) and gradually leading to coma, occasionally preceded by a severe headache or a syndrome that resembles the aura of epilepsy.

Bleeding

The appearance of cerebral uremia, manifesting itself by severe headache, neuralgia, psychic disturbances, insomnia, twitchings, amaurosis, etc., is usually a grave danger signal, generally constitutes a premonitory warning of an impending uremic attack and should be fought most energetically. Bleeding is the sovereign remedy, carried out as described on page 37. A considerable quantity of blood, if need be a quart, should be withdrawn. A uremic attack may often be prevented in this way. If large quantities of blood are withdrawn, venesection may be followed to advantage by the infusion of an amount of warm, sterile, physiological salt solution (0.8 gm. to 1000 cc.) corresponding to the quantity of blood abstracted.

Infusion of physiological salt solution

Narcotics

Chloral enemas

Urethan

Lumbar puncture

The symptoms about the nervous system unfortunately, as a rule, cannot be controlled by any other drugs than narcotics, i. e., morphine or opium. Occasionally enemata, containing ten to fifteen grains of chloral, repeated every two hours, or inhalations of chloroform, become necessary. Urethan also is useful here, given by rectum in watery solution in large doses, i. e., about five drachms (about 20 gm.) in twenty-four hours. In severe spinal manifestations lumbar puncture should be done. It will often be found that the fluid in the cerebrospinal canal stands under high pressure, and symptomatic relief is frequently obtained by drawing it off, thus reducing this pressure. Lumbar puncture possibly also relieves by withdrawing fluid that contains much toxic material in solution from intimate contact with irritable nervous tissues.

VI. DISEASES OF THE BLADDER AND URETHRA—CYSTITIS.

(By Dr. F. Kreissl, Chicago.)

Definition

In the treatment of cystitis, irrespective of any conventional classification, we have to bear in mind that the disease is merely a symptom of some underlying pathological lesion, that every true cystitis is of mycotic origin and that "simple cystitis" is only a theoretical condition.

Prophylaxis

Since the mode and avenues of the infection have become better known and since it has become established that traumatism and infection by instruments is one of the most frequent contributing causes of cystitis, much has been accomplished in the way of *prophylaxis*. This source of infection can be and is successfully eliminated by extreme cleanliness, asepsis and antisepsis in everything that comes in contact with the urethra, in cleansing of the latter preceding and following the use of instruments, in preventing stagnation of urine in the bladder, and in exercising better care of the urinary tract during labor and gynecological operations.

Indications for treatment

The principal indications for the *treatment* of cystitis are:

1. To remove the cause
2. To relieve pain and frequent urination.
3. To modify the character of the urine so as to make it an unfavorable medium for the development of pathogenic microbes, and
4. To check suppuration.

Rest

Diet

Liquids

Purgation

In the acute stage, as in many other local inflammations, rest in bed should be insisted upon until the symptoms are well under control. The food should be bland and should consist largely of fluids in small quantities, milk, or milk mixed with Vichy being preferable. The still customary ingestion of large quantities of fluids in cystitis should be discouraged, as it only increases the congestion of an inflamed organ which is much in need of rest. Careful attention should be given to the bowel. A purge of calomel and pulverized jalap, 0.10 of each, followed by a wineglassful of magnesia citrate answers the purpose.

Sitz bath

Fomentations

Opiates

A hot Sitz bath of 105° F., if necessary repeated several times daily, will afford much immediate relief to the pain and tenesmus. Hot fomentations applied to the perineum and above the pubes are almost as efficient; so is sitting over steaming water. An anodyne will often be necessary in addition to control the vesical tenesmus, pain and irritability. The remedy *par excellence* is opium and its alkaloids. It should be given by mouth or rectum. If given by mouth, the addition of fol. uvæ ursi, or the time honored linseed decoction with salol will be serviceable:

Dose and administration

℞

Decoct. sem. lini. or (infus. fol. uvæ ursi),	10.0-150.0
Salol,	4.0
Tinct. opii spl.,	gtts. xx.
Syr. spl.,	30.0

Sig. A tablespoonful every two hours.

For suppositories the extract of opium should be combined with the extract of belladonna:

℞

Extract opii, or (Morphine sulphate, 0.08)	0.18
Extract of belladonna,	0.06
Olei cacao,	6.0

Ft. suppositories No. vi.
Sig. One suppository twice to three times a day.

Balsams
Santal oil
Pichi Pichi
Gonosan
Uva ursi
Buchu
Herniaria

The balsams, oleum santali, fluid extract of pichi pichi, Gonosan, a combination of kava kava and purified sandalwood oil, all have a sedative effect in acute cystitis. The folia uvæ ursi, the folia buchu and the herba herniariæ are also still in use. They are taken as infusions, either singly or in mixture of equal parts of these herbs, about a heaping tablespoonful to a large cup of boiling water. Gonosan is free from the disagreeable effects of the sandalwood oil and to avoid the unpleasant eructations should be taken on a full stomach, and very little of fluids consumed during or soon after the meal. The dosage is two to three capsules, three times daily. It is especially efficient in gonorrheal cystitis.

Internal antiseptics
Salol

Sometimes it will be necessary to give internal antiseptics in order to attack the root of the evil. The most commonly employed remedies of this class are salol, camphoric acid, boric acid, benzoic acid and last, but not least, urotropin. Salol is given in doses of 0.3 to 0.5 gm., three times daily; being a phenol derivative, it should not be prescribed where kidney lesions exist.

Combining useful antiseptic and astringent qualities is the following formula:

℞

Salol, Extract of uvæ ursi sicc.,	āā 5.0

M. ft. Pill, No. XXX.
Sig. Two to three pills three times daily.

Boric acid

Boric acid, to be effective, has to be taken in doses of 0.5 to 1.0 gm., several times a day; this occasionally, it must be remembered, may cause toxic symptoms such as exanthema, albuminuria and extreme weakness.

Camphoric acid
Benzoic acid

The dosage of camphoric acid is 1.0 gm., three times a day, of benzoic acid 0.3 to 0.5 gm., three times a day. Both have a marked deodorizing effect on ammoniacal urine, but distress the stomach if given for a long time.

Urotropin

Dose and administration

Helmitol

In urotropin we possess the strongest urinary antispetic of more recent date. However, it does not seem to have any effect on the gonococcus or the bacillus tuberculosis. It requires an acid urine in the renal pelvis in order to develop its active principle, formaldehyde, but the latter after being once liberated, acts alike in acid or alkaline urine. In the cystitis of typhoid fever it is, so to say, a specific. It is given in doses of 0.3 to 0.5 gm. twice to three times daily and should always be dissolved in a few ounces of water in order to avoid distressing stomach symptoms. It may be used for weeks and months without any ill effects. Occasionally albuminuria and hematuria may be observed, which rapidly subside when the drug is discontinued. It rarely causes dysuria, excepting occasionally in an ulcerated bladder. In these cases helmitol, another formaldehyde preparation, has been used, but with no better results.

Local applications to the bladder

While in many cases the symptoms of acute cystitis disappear under this treatment, it sometimes becomes necessary to make local applications to the bladder besides. The key to this treatment is given by the intolerance to tension of the inflamed bladder wall. Therefore, large or even moderately large injections are objectionable and only soft instruments of smallest calibre should be introduced.

Treatment by instillation

The best method to employ is instillation, performed by applying locally drop by drop the active medicinal solutions to the inner surface of the bladder wall. The strength of these solutions used, the small quantity of fluid instilled, and the slowness with which one by one they enter the viscus, are the important points to be attended to. Instillations should not be hurriedly given, or they then become injections; the solution, although by no means always a caustic one, is far stronger than could be used in the form of an injection, and this constitutes the chief virtue of instillations.

The instruments required are a small, graduated syringe and the instillator, which is a perforated, gum elastic, olive tipped bougie. In Guyon's syringe the contents is one dram. In the first place, the bladder, as in all instrumentation of the urethra, should be empty. The quantity used should never exceed one dram. The strength of the solution that may be used is as great as its quantity must be small. While the bladder could not be irrigated with a nitrate of silver solution stronger than 1 in 500, instillations of from one to five per cent. may be used with perfect toleration.

Solutions of the strength of 1 in 20,000 of bichloride of mercury may be used for injections, but for instillations of solutions the strength of 1 in 5000 and 3000 may be used and some patients even support 1 in 1000. But as a rule the first instillations should be still milder, the concentration of the nitrate of silver solution not to exceed 1 in 1000 and the bichloride of mercury 1 in 10,000. When increasing the strength the quantity should be decreased, as for instance of ½ to 1 per cent. nitrate of silver solutions or of 1-2000 to 1-1000 bichloride solutions not more than 15 to 30 drops should be used.

The substances that will be found most satisfactory may be divided into (1) anesthetics, and (2) antiseptics.

Anesthetics

1. Anesthetics are very valuable as treatment in themselves and as a preliminary to instillations of more or less painful solutions. In mild cystitis, where there is no excessive tenesmus to tension, antipyrin in ten times its weight of water renders the mucous surface of the bladder less sensitive to the subsequent application of nitrate of silver. In very acute cystitis guaiacol is superior to antipyrin and cocaine, especially in the formula of Pirot, viz., iodoform, 1 part, guaiacol, 5 parts; sterilized oleum benne, 100 parts; of which solution one dram may be injected three times daily without any inconvenience. Great care has to be exercised in applying cocaine to the bladder cavum, on account of its ready absorption from raw surfaces. A good rule is never to exceed the injection of one and one-half to two grains of the drug.

Antiseptics

2. Antiseptic Instillations. Perchloride of mercury in solution of 1 in 5000 or 1 in 3000 will be found of great service, especially in the constant and prolonged agony of tuberculous cystitis. Its effect is still more pronounced if used alternately in two days' intervals with the iodoform guaiacol suspension given in the preceding formula. Another specific in tuberculous cystitis is "Gomenol." Its analgesic action is equal to that of guaiacol while its antiseptic properties are more pronounced. It is used in the form of instillations of 10 per cent. and 20 per cent. gomenoloil, one dram of the oil being instilled into the empty bladder night and morning.

Nitrate of silver is perhaps the most valuable local agent in the treatment of cystitis. The more acute, the more painful the cystitis, the more frequent the desire to micturate, the more clear is the indication for instillations with nitrate of silver, hence its effect is little short of astounding in acute gonorrheal cystitis. In recent years I have quite extensively used argyrol in acute and sub-acute cystitis, and it has given me much satisfaction. Being inferior to the nitrate of silver as a germicide it lacks the irritating quality of the latter, a point to be considered in the presence of so much pain and suffering in acute inflammation. For instillations 4 cc. of a 5 per cent. to 20 per cent. solution of argyrol may be used.

In the more chronic state irrigations of the viscus become necessary when the viscid pus clinging to the bladder wall, or mineral deposits in a diverticle, call for a thorough cleansing preceding other topical applications. But even then one should never inject more than two ounces at a time, because the bladder muscle reacts differently towards slow or rapid tension, a fact of which one may convince himself by rapidly filling a normal bladder with ten ounces of fluid. There will be tenesmus for quite a while afterward, while the same bladder does not take notice of such a quantity if accumulated in the natural way and time. The result of such rapid filling of a diseased bladder is seen in renewed congestion and secretion and many a protracted cystitis is due to this procedure. Moreover, the cleaning of the bladder wall is much more thoroughly accomplished by small and repeated flushings than a few large ones. For all these reasons a sterile piston syringe is preferable to the time-honored irrigation can. Chinosol and pyoktanin in a solution of 1 in 4000 have a marked deodorizing effect on very offensively ammoniacal urine. One dram of a 5 per cent. iodoform suspension most effectively checks ammoniacal decomposition of the urine but the strong odor of the remedy prevents its general adoption outside of a hospital. Salicylic acid in solution of 1 in 3000 dissolves phosphatic debris and renders an alkaline urine neutral or slightly acid. A saturated solution of boric acid, or a solution of 1 in 3000 of acetate of lead has a soothing effect in simple congestion of the mucosa associated with a mucous secretion, but it is of no antiseptic value.

If with all these procedures no marked improvement becomes noticeable within a reasonable time, one has to resort to cystoscopy to determine the real condition back of a symptomatic cystitis, which is not amenable to a radical cure unless the original cause is removed.

Cystoscopy

Stones will have to be crushed or removed by lithotomy. Ulcerations must be curetted and cauterized through the operation cystoscope, or excised through a suprapubic or a vaginal opening, as the case may require, and a rebellious cystitis dolorosa, where the whole bladder wall represents a large sloughing ulcer, requires broad incision and drainage, like any other abscess. Topical applications and internal medication will fail when strictures, prostatic obstructions or a diverticle cause the formation of a pool of stagnating residual urine in the bladder which forms an excellent culture medium for microbes.

It is, of course, also impossible to restore normal conditions of the bladder wall if a continuous or interrupted stream of pus from adjacent organs or from the upper or lower urinary passages floods the vesical cavity. Neither will local treatment in secondary tuberculous cystitis be efficient, unless we support the reconstructive power of the tissues by a general hygienic treatment of the system, or by the removal of the primary seat of the trouble.

VII. ACUTE URETHRITIS.*

(By Dr. F. Kreissl, Chicago.)

The treatment of acute urethritis depends upon its etiology.

Non-infectious urethritis

The discharges of *non-infectious urethritis,* as observed under various and different etiological conditions, show a marked tendency to a rapid cure, if the cause is recognized and removed. A urethral secretion following a *traumatism* like the use of instruments, foreign bodies, a new-growth in the canal, masturbation or excessive coitus, will spontaneously cease when the cause of the trouble ceases to exist. This will also occur in discharges due to chemical irritations such as strong injections with bichloride or silver solutions, frequently used as a prophylactic after cohabitation. Urethral secretions appearing as a part of the symptoms of general conditions such as gout, constipation, phosphaturia and oxaluria, will yield to the proper constitutional treatment of these ailments.

Infectious urethritis

The four best known types of *infectious urethritis* are, in the succession of their frequency:

1. Gonorrheal urethritis.
2. Infectious urethritis of non-gonorrheal origin.
3. Urethritis tuberculosa.
4. Syphilitic urethritis.

1. GONORRHEAL URETHRITIS.

The efforts made for years to prevent the results of an inoculation with the gonorrheal virus, in short, to find an effectual *prophylactic,* seem to have been rewarded. In a two per cent. nitrate of silver solution, or in a four per cent. protargol solution, we now possess a reliable preventive. To this end, a few drops of either solution are applied with a syringe or a glass dropper in the fossa navicularis and there retained for a few minutes, shortly after a suspicious cohabitation.

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* Chronic urethritis is amenable to successful treatment only at the hands of the skilled surgeon-specialist and will hence not be discussed in this volume.

Abortive treatment

This should be tried in every case of urethritis which is not older than three days. While, of course, the best results may be expected on the first day of the manifestation of the disease, there are sufficient proofs that the gonococcus does not always penetrate so rapidly into the tissues as to escape the influence of the germicide even after a few days; and as long as no harm can be done by this treatment, if judiciously applied, it is worth while to attempt an abortive cure within the above time limit. After irrigating the anterior urethra with a hot boric acid solution, I constrict the urethra at the peno-scrotal junction with a rubber band, inject one drachm of a four per cent. protargol solution and have it retained for five to ten minutes. For the irrigation with the boric acid solution a piston syringe is used and a sterile elastic catheter. No pressure to distend the urethra should be applied and the fluid should commence flowing through the catheter before it enters the urethra; this prevents the dissemination of infectious material.

Treatment during first eight days

During the following eight days I irrigate the anterior urethra in the same way with a pint of a 1:5000 hot nitrate of silver solution, once a day. The discharge, if there is any, is examined microscopically every day. If no gonococcus is present in the last five specimens, the treatment is discontinued; otherwise, the *systematic treatment* for gonorrheal urethritis is commenced.

Systemic treatment

Avoidance of alcohol

The use of alcohol is absolutely prohibited except in patients in whom, from long continued habituation, grave nervous disturbances would follow its sudden withdrawal. In these cases some claret diluted with water may be allowed.

Sexual life

Sexual excitement and physical exertion must be rigorously avoided.

Diet

The diet should be non-stimulating. Meats in excess, highly seasoned foods, strong tea or coffee are to be avoided in the acute stage.

Suspensory

A well fitting suspensory bag will relieve the sensation of dragging on the spermatic cord when the patient has to be much on his feet. A piece of antiseptic gauze—not cotton—to catch the discharge should be placed around the glans penis in such a way as not to constrict the urethra. Most convenient for this purpose are the little bags called gonorrhea bags. For women, a gauze sponge saturated with an antiseptic should be placed between the labiæ and renewed after each micturition.

Local treatment

The *local treatment* of the infected area should be commenced at once, irrespective of the stage of the disease. The best results, the most rapid recoveries and hardly any complications are observed under these conditions.

In order to deal successfully with acute gonorrheal urethritis the following points should be remembered:

1. The acute symptoms are due to the irritating qualities of the toxins.

2. The tissues if slightly assisted are usually capable of taking care of the gonococcus, consequently the toxins will have to be frequently removed and the gonococcus as far as it can be reached destroyed by a remedy which does not increase the inflammatory conditions already present.

Therefore, injections and not irrigations under pressure have to be employed and even Janet, the sponsor of the irrigation method for acute gonorrheal urethritis, has come to my point of view on this subject as I expressed it many years ago. The syringe should have a capacity of three drachms, should have a blunt tip and may be made of glass, rubber or metal so that it can be thoroughly cleansed and sterilized. The quantity to be injected at a time depends on the capacity of the anterior urethra; however, enough fluid should be used to slightly balloonize the canal without any perceptible discomfort to the patient. It should also be borne in mind that the capacity of the urethra varies with the degree of inflammation.

Protargol injections

The remedy which has given me the most satisfactory results for many years, and which now seems to be generally recognized as the most valuable, is protargol. If judiciously used it promptly destroys the gonococci, where they can be reached by this specific; it shortly allays inflammation, and surely prevents complications.

Strength of the solution

The strength of the solution, the frequency of the injection and the length of time it is to be retained depend on the stage of the disease. Generally speaking, I would say that in the acute stage with much inflammation the solution must be very dilute; it should be injected at short intervals and retained but a minute. With the acute symptoms subsiding the strength may be increased, the frequency of the injections reduced and the solution retained longer.

As a routine treatment for this class of cases I would recommend the following procedure:

Technique

The patient should urinate before each injection so as to mechanically remove the secretion from the urethral wall. He should then inject a one-eighth per cent. solution of protargol and retain it for one minute, repeating the treatment every two hours during the day *and twice during the night.* The latter point is of the utmost importance for a speedy and safe cure, and many complications and chronic cases are due to the neglect of this rule, which I have tried to impress upon the practitioner for many years.

Importance of night injections

After three days a 1/4 per cent. solution should be injected every three hours during the day *and once during the night.* At the end of the first week the strength of the solution may be increased to 1/2 per cent. to be injected every four hours and retained five minutes and the night injections discontinued. At the beginning of the third week the same solution is injected three times a day and retained ten minutes at a time. At the beginning of the fourth week, when the secretion will be found to contain mostly epithelial cells, none, or but a few, leucocytes and no gonococci, an astringent and mild antiseptic will be substituted for the morning and noon injection with protargol, but the latter is still to be used before retiring. In the following two weeks only the astringents may be injected, if repeated examinations have shown the permanent absence of gonococci.

Treatment during second and third week

Fourth week

The most commonly employed and the most serviceable astringents are:

Astringents

℞

Zinc sulphocarbolate,	0.60
Resorcin,	1.80
Aqua distill.,	140.00
Fluid extract hydrastis,	40.00

Sig. Inject mornings and noon.

℞

Zinc sulph.,	1.0
Plumb. acet.,	2.0
Aqua distill.,	200.0

Sig. Inject mornings and noon.

This is the old Ricord's formula.

℞

Cupr. sulph.,	0.20
Alum crud.,	1.00
Aqua distill.,	200.00

Sig. Inject mornings and noon.

The astringents should only be retained for a minute at a time.

Fresh solutions of protargol, not older than three to four days, should be used and they should, therefore, not be made from stock solutions and must be kept in stained glass bottles. **Preparation of solutions** They should be prepared slowly by spreading the powder on the surface of cold water and not by mixing, stirring, heating or by the addition of solvents. These small details seem to be overlooked quite frequently but are important to obtain good results.

Female gonorrhea The female urethra is not suitable for injections nor is it possible to retain fluids therein for any length of time. Instead **Bougies** of these I have always successfully employed urethral bougies, one and one-half inches long, made of protargol and gelatin. They are inserted in the urethra once and, later on, twice a day and there retained for ten to fifteen minutes by a pledget of gauze or cotton slightly pressed against the urethral orifice. By squeezing the bougie for an eighth of an inch upward from the orifice oftentimes no artificial retention at all, in the recumbent position, is necessary. After the gonococcus has disappeared from the discharge, astringent, medicated bougies are inserted on alternating days with protargol bougies for about two weeks and, finally, the astringent alone for another week. **Vaginal douches** Precautionary hot vaginal douches with a quart of a 1 in 3000 protargol solution, or 1 in 10,000 nitrate of silver, twice and later once a day, are used. **Toilet of external parts** The vestibulum, the area around the vulvo-vaginal glands, the urethra and the clitoris should also be cared for in the same way. Occasionally, but rarely, it will be necessary to employ protargol solutions as strong as 1 per cent.; they may not be used more than once a day and, if found inadequate, a 1 in 2000 nitrate of silver solution, injected twice a day, may be substituted with satisfactory results. Where this fails after it has been tried for a reasonable time, closer investigation will reveal some complication, **Complications in women** the most common being infection of a paraurethral duct; a periurethral or a follicular abscess; invasion of the Cowper glands; or the disease has crossed the external sphincter and invaded the posterior urethra with or without producing acute inflammatory symptoms.

Acute posterior urethritis Acute posterior urethritis, which is characterized by symptoms identical with those of acute cystitis, requires rest in bed for a few days, a strict milk diet, care for the bowels, in short, the same management as acute cystitis. Injections in the anterior urethra should be discontinued until the acute symptoms have subsided and the medication indicated for acute cystitis instituted. **Gonosan** Gonosan, which I prescribe in these cases, has not the least specific effect on the gonococcus, as is claimed for it, but it renders the urine bland and helps to allay the inflammatory symptoms. With the improvement of these symptoms the injections may be resumed and local treatment of the deep urethra and the vesical neck added. Daily, deep injections with one drachm of a 1 per cent. to 2 per cent. protargol solution will answer the purpose. They are given like bladder instillations (see Section on *Cystitis*), with the difference that the tip of the catheter or of the instillation bougie is placed in the vesical neck and the solution is deposited, drop by drop, over the whole inflamed area while the catheter is being slowly withdrawn to the external sphincter.

Deep injections with protargol

Prostatitis.

This complication of acute gonorrheal urethritis requires besides the treatment for acute posterior urethritis, applications of cold to the posterior aspect of the prostate in order to prevent suppuration. This is best accomplished through the rectophore applied for fifteen to thirty minutes, several times daily. The temperature of the water circulating through the apparatus should not be so low as to produce discomfort. Ice bags applied to the perineum add to the comfort of the patient.

Rectophore

Ice bags

Retention of urine, as it occurs in some of these cases, may be relieved by catheterizing under the necessary and well-known antiseptic precautions. Only soft rubber catheters are permissible for this purpose. If, in spite of antiphlogistic treatment, pus forms and a *prostatic abscess* can be palpated through the rectum, one should not be too hasty with an operation as the abscess frequently ruptures spontaneously into the deep urethra, an event that is announced by the appearance of much pus mixed with the urine and a remission of all distressing symptoms. If the abscess does not rupture spontaneously within a few days after it becomes palpable, it should be evacuated by a perineal opening to prevent serious complications, for, if not surgically relieved, the pus might break through the capsule and burrow its way beyond our control.

Retention of urine

Catheterization

Prostatic abscess

Surgical relief

Epididymitis.

The indications for the treatment of this disorder are:

1. To relieve the pain and inflammation, and
2. To promote the absorption of the inflammatory products.

The first indication is best accomplished by rest in bed, a suitable support for the testicle and the application of heat in the shape of hot fomentations or a hot poultice. If taken in hand before the acute symptoms have reached a climax the following procedure has always given me satisfaction: Apply a solution of equal parts of guaiacol and glycerin with a brush or a gauze sponge all over the scrotum of the afflicted side; this causes considerable smarting for several minutes. The whole

Rest

Heat

Guaiacol and glycerin applications

Suspensory

scrotum is wrapped in a square of absorbent cotton, 12x12 inches, and one inch thick. This is covered with a piece of oilsilk or rubber protective tissue of the same size and the whole held in place by a large sized suspensory bag. The bag for this purpose must be extra large to accommodate the voluminous mass to be placed therein and should have a strong elastic abdominal band, the latter to be adjusted high enough to suspend the testicle as high as possible. The guaiacol acts as an antiphlogistic and an anodyne, the cotton, covered with oilsilk, as a dry poultice, and the suspensory, if properly adjusted, takes away all the dragging of the testicle on the tender and inflamed cord. The effect is a momentous one, patients whose features were distorted with pain, are able to walk briskly immediately after the testicle is immobilized in the manner described. One application of the guaiacol is sufficient but the cotton, being worn down, has to be renewed at least once in twenty-four hours.

Internal treatment

Three grains of salicylic acid with lemonade, taken twice daily, seem to assist in the acute stage. Within five to eight days the swelling of the epididymis is usually reduced by one-half and the greater part of the inflammatory effusion in the albugineal sac has become absorbed.

Moist heat

Scarification of the tunica vaginalis

Abscess of epididymis

Latent tuberculosis

Moist heat furthers the removal of the infiltration in the epididymis at this stage. Eight thicknesses of a piece of moist gauze, 12x12 inches, are wrapped around the whole scrotum, this is covered with oilsilk of the same size, over this is placed a layer of cotton, 12x12 inches and one-half inch thick, and the whole is supported in the suspensory bag, to be renewed mornings and nights. In a few cases the very profuse effusion in the albugineal sac causes so much tension that absorption becomes impossible. In this event Vidal's multiple scarification of the tunica vaginalis will be necessary to open an avenue for the escape of some of the fluid. In rare instances abscess formation in the epididymis occurs, in which event broad incision of the albugineal sac and evacuation of the pus will bring speedy relief. This pus ought to be carefully examined, as usually a latent tuberculosis is back of these suppurations. The same should be remembered in the ever recurring swellings of the epididymis without a palpable cause.

All local treatments have to be discontinued in the acute stage of epididymitis and no balsams of any kind given internally. Many a case of a persistent acute inflammation will readily disappear under proper treatment when this latter point is observed.

2. INFECTION URETHRITIS OF NON-GONORRHEAL ORIGIN.

Causes

Predisposing factors

Owing to the fact that very little is known about the nature and origin of this peculiar form of urethritis, it is not surprising that we do not as yet possess any definite means to successfully deal with the trouble. Streptococcus, staphylococcus. pneumococcus, pseudo-diphtheria bacillus and coli-bacillus which are found in the discharge of these cases also exist in the normal urethra without producing any symptoms. From observations extending over a number of years it seems to me that these microorganisms occasionally become virulent on a mucosa which by some provocation has lost its natural powers of resistance and has thus become transformed into a favorable culture medium; in fact, upon inquiry we can often trace the trouble to a preceding sexual excess, prolonged and violent exercise, forcible urethral instrumentation, etc. I have seen such discharges appear after sexual excesses carried on with the protection of condoms, and after instrumentation under all possible antiseptic precautions, so that a transmission of the infection was at least in these cases out of question. In others the infection occurred simultaneously with the inoculation with the gonococcus, and in still others a chronic gonorrhea rendered the urethra more susceptible to the subsequent mixed infection.

Urotropin

Mercurol

Ichthyol

Regarding treament very little of value can be said. The few cases of coli infection which I have seen yielded promptly to internal medication with large doses of urotropin or other formaldehyde preparations. In a few staphylococcus infections mercurol, in one-half to two per cent. solutions, proved very effective; also two per cent. ichthyol solutions, provided the patient could tolerate the smarting sensation caused by the medicine.

Diphtheria-antitoxin

Electrolysis

In one case in which the urethroscope showed several islands of pseudo-membrane, and the culture nothing but pseudo-diphtheria bacillus, I used antitoxin hypodermically on two successive days, and the discharge disappeared. I have seen the case since then repeatedly. This is now over two years ago, and everything is apparently normal. Perhaps a urethral injection with the antitoxin might have had the same effect. Encouraged by this result I tried this treatment in other cases in which the diphtheria bacillus was found in company with staphylococcus and pneumococcus but without success. In a few cases I used electrolysis in apparently diseased pockets and follicles with good results.

Intractable character of the trouble

Very few of these cases seem to improve under any method of treatment, but they get worse as soon as treatment is discontinued, and most of them even while under the treatment. A few recover without any treatment, some of them completely, some to that extent that the discharge ceases, but shreds are constantly present in the urine. Most of them seem to remain well for days, weeks, even months at a time, when with or without evident cause the secretion reappears. Several times I have seen the trouble permanently disappear after a reinfection with gonorrhea. One of my patients, who carried this infection for over two years, lost it permanently after a severe typhoid fever.

Radio-active fluids

Light having a deleterious effect on pneumococcus and bacillus diphtheriticus, I utilized injections with radio-active fluids, but with the same varying results. A specific has still to be discovered.

3. URETHRITIS TUBERCULOSA.

Hygienic and symptomatic treatment

As a rule, this is the local manifestation of the constitutional trouble or the partial symptom of a more or less generalized tuberculosis of the urogenital tract, and requires a hygienic and symptomatic treatment. Instrumentation is to be avoided. The same topical treatment as in cystitis tuberculosa may afford some relief, but a cure depends on the extent of the urinary lesion and the possibility of dealing successfully with the latter, and in this respect the prospect is not very encouraging, as the disease is usually far advanced before urethral manifestations are observed.

4. SYPHILITIC URETHRITIS.

Injections of bichloride solutions

If caused by the primary lesion of syphilis—the hard chancre—the proper local and constitutional treatment (see Section on *Syphilis*) is sufficient. The ulcus being situated near the orifice can easily be reached by local medication. This consists in injections with a drachm of a 1 in 5000 bichloride solution, twice a day, followed by the insertion of a urethral bougie,

Bougies

one inch long and one-eighth of an inch thick, consisting of:

℞

Olei cacao,	0.30
Iodol,	0.06

Ft. Urethral bougie.
Sig. One twice a day.

Cauterization

If the healing is retarded, or bleeding due to flabby granulations is observed, the ulcer has to be exposed in a short urethroscope and cauterized with a concentrated nitrate of silver, or sulphate of copper solution—from 10 per cent. to 50 per cent. Secretions, due to secondary syphilitic lesions in the urethra, readily yield to the constituional treatment supported by a few irrigations of the anterior urethra with a 1 in 1000 nitrate of silver solution.

Nitrate of silver irrigations

CHAPTER VI.

DISEASES OF THE MOUTH AND UPPER AIR PASSAGES

INTRODUCTION.

Nearly all the diseases of this region of the body call for topical and surgical treatment. A few of the more acute varieties, especially those that are complications or part phenomena of general constitutional or infectious diseases, however, belong to the province of the internist. The more chronic disorders that are accompanied by advanced anatomic changes (hypertrophies and atrophies, deformities, abscess, ulcer formation, etc.) should be treated by special surgeons alone. Whereas the latter should by all means be competent general practitioners, it is nowadays not necessary nor, for that matter, possible, for the general practitioner to be a competent specialist. It is, in fact, almost more important that the latter should recognize his limitations in this direction, than that he should attempt without adequate training to encroach upon the domain of the skilled, experienced specialist. It is due precisely to failure on the part of the general practitioner to recognize these limitations that there is so much promiscuous, uncalled-for, and generally harmful spraying and applying, cutting and cauterizing about the nose and throat.

The diseases of the mouth and upper air passages that the internist is frequently called upon to treat, either because their onset is very acute or because they accompany various general disorders, are the different forms of stomatitis, acute rhinitis, including hay fever and pseudo hay fever, pharyngitis, acute tonsillitis and acute laryngitis. The treatment of these disorders alone, therefore, will be discussed in this chapter.

I. DISEASES OF THE BUCCAL CAVITY.

STOMATITIS.

Causes

Stomatitis complicates a variety of infectious diseases, gastrointestinal and hepatic disorders, cachexias and anemias, certain metabolic disorders as diabetes, the uric acid diathesis and acetonemia, the hemorrhagic diathesis. In children during the period of dentition, and especially in bottle-fed infants and children with rickets, mouth disorders are common. Finally, in all unconscious states the mouth is apt to become diseased; the stomatitis, in the latter instance, being due in great part to deficient salivary excretion and the inhibition of masticating and swallowing movements, causing the mouth to become dry and preparing a particularly favorable nidus for the development of bacteria and fungi about the gums, the mucous lining of the mouth and the tongue.

Prophylaxis in acute infectious diseases

Mouth washes

Glycerin

In the acutė infectious disorders it is particularly important to prevent the development of stomatitis, so that the patients during convalescence may not be hindered from eating on account of soreness of the buccal cavity. The prophylactic measures that must be employed in infectious and in comatose states are the following: In order to induce swallowing, to promote the flow of saliva and to prevent cracking of the tongue and lips, the mouth should be washed out every two or three hours with a linen rag dipped either in a saturated solution of boric acid, or a three per cent. bicarbonate of soda solution, or a two per cent. solution of chlorate of potash. The latter remedy should not be used if the kidneys are affected. In patients who are altogether unconscious the tongue should be painted with glycerin, or boric acid in glycerin in the proportion of one part of boric acid to four parts of glycerin, and so much should be applied that a portion of the glycerin trickles down into the pharynx. Ice pills should be inserted into the mouth or teaspoonful doses of lemonade poured in at frequent intervals. In order to force swallowing movements, pressure may be exerted upon the base of the tongue. On the lips glycerin should not be used because it is too hygroscopic. Here vaseline or lanolin are the proper applications. If all these measures are carefully carried out a sore mouth will rarely develop, even in so protracted a disease as typhoid fever.

Prophylaxis in cachectic conditions

In chronic cachectic conditions, in sufferers from the hemorrhagic diathesis, in diabetes, the following mouth wash is very useful:

℞

Biborate of soda,	30 gm.
Menthol water,	150 cc.
Distilled water,	950 cc.
M. Sig. Mouthwash.	—(Ortner.)

Fetor

Of this mouth wash a teaspoonful in half a glass of water should be used as a cleansing solution after each meal.

A useful prescription for the excessive fetor in diabetes has been given on page 140. The following astringent wash is also very useful, particularly if there is a tendency to bleeding from the gums:

Bleeding gums

℞

Thymol,	35 gm.
Benzoic acid,	3 gm.
Tincture of eucalyptus,	15 cc.
Absolute alcohol,	100 cc.
Peppermint oil,	20 drops
M. Sig. Mouthwash.	—(Miller.)

Of this solution a teaspoonful in half a glass of water should be used as a wash or gargle.

In all forms of stomatitis, too hot, too cold, too hard or rough articles of food, spices, strong alcoholic beverages, and also tobacco should be carefully avoided.

Five varieties of stomatitis

If the mouth disorder is once established the treatment differs somewhat according to the character of the stomatitis. For practical purposes it is convenient to distinguish five varieties. First, simple catarrhal or erythematous stomatitis; second, aphthous (follicular or ulcerative) stomatitis; third, thrush (stomatitis due to *oidium albicans*); fourth, gangrenous stomatitis (noma, cancrum oris); fifth, mercurial stomatitis and ptyalism.

Treatment of simple catarrhal form

In the simple catarrhal form the measures described under prophylaxis should be employed for the sake of promoting cleanliness and antisepsis of the mouth. At the same time any underlying constitutional, gastro-intestinal or hepatic disorder should be treated. No special local treatment is required.

Treatment of ulcerative and aphthous form

In the ulcerative or aphthous form each ulcer should be touched with a stick of silver nitrate, or cauterized with a galvano-cautery or a Paquelin. The best liquid application in the ulcerative form is a mixture of potassium chlorate in glycerin in the proportion of one to two. Potassium chlorate is a particularly useful remedy in the ulcerative form, but should be used carefully in the aphthous, for, in the latter, it increases the pain. If kidney disease is present it should never be used. Potassium is excreted in part through the saliva, so that it usually grants a prolonged local effect in the mouth. A one per cent. sodium salicylate solution, or a one to one thousand permanganate of potash solution, may also be used for washing out the mouth and touching up the ulcers. If the mouth is very sore and painful a few drops of opium tincture or cocaine may be added to the solutions. A very useful preparation is the following:

℞

Salicylic acid,	1.0
Cocaine muriate	0.1
Glycerin,	10.0
Water,	10.0

M.

Treatment of thrush

Thrush is usually preventable if rigid cleanliness of the mouth is maintained. In nursing children particular care should be exercised to have the nipples clean. Gastro-intestinal disorders should be carefully treated and corrected. The best local applications are potassium chlorate in a two per cent. solution, or potassium permanganate in a one pro mille solution. These are best applied on rags that should be rubbed against the affected areas in the mouth. Internally, resorcin, one to one hundred, in teaspoonful doses, two or three times a day, is said to exercise an inhibitory effect upon the development of thrush (Baginsky).

Treatment of noma

Gangrenous stomatitis is a very dangerous complication and one that always calls for energetic local treatment. The gangrenous areas should be destroyed either by a galvano-cautery or a Paquelin cautery, or by the application of nitric acid or silver nitrate in stick form. If the line of demarcation does not form within a day or two an artificial line of separation should be produced by the use of these caustics and the gangrenous areas excised.

Treatment of mercurial stomatitis

Mercurial stomatitis can generally be prevented by careful mouth asepsis carried out as described under prophylaxis. Certain individuals, however, seem to have a peculiar susceptibility to mercury and become salivated upon the exhibition even of very small doses. As soon as the first evidence of stomatitis (usually soreness about the gums) becomes manifest, the administration of mercury should at once be stopped.

Potassium chlorate
Peroxide of hydrogen

Two remedies are particularly useful in the fully developed form, namely, potassium chlorate and peroxide of hydrogen. The former should be used in a mouth wash in a two or three per cent. solution, or a tooth brush may be dipped into powdered chlorate of potash and the teeth and gums energetically brushed with it. Peroxide of hydrogen should also be given in the strength of about two per cent. As the commercial preparations contain about 10 per cent., a teaspoonful to one-third of a glass of water approximates the proper concentration.

Atropine

If mercurial ulcers develop they should be treated with a silver nitrate stick, or should be painted with tincture of iodine or touched with chromic acid. Free catharsis should be promoted, sweating induced, preferably by hot bathing, and the patient should be instructed to drink plenty of water. Internally, atropine in one-two-hundredth grain doses given three times a day often beneficially influences mercurial stomatitis.

TONSILLITIS.

Classification

The mucous lining about the orifices of the tonsillar crypts may become involved in any catarrhal state of the mouth or upper air passages, or the crypts alone may be attacked (lacunar or follicular tonsillitis) or the whole gland, including its adenoid tissues, may be diseased (parenchymatous tonsillitis), or the infection may be suppurative in character (tonsillar or peritonsillar abscess). The treatment of these different forms does not vary materially. In the suppurative variety, of course, surgical evacuation of the pus becomes necessary.

Abortive treatment

Upon the onset of the first symptoms the bowels should be thoroughly evacuated, probably best by the use of ten one-tenth grain doses of calomel given at ten minute intervals, followed by a tablespoonful of magnesium sulphate in water. The diet should be non-irritating to the throat, i. e., should contain no rough or hard particles nor spices, nor should it be too hot.

Aconite

Guaiac and Salicylates

Internally tincture of aconite, in drop doses, should be given at two hour intervals throughout the attack. The most useful remedies for internal use, possibly owing to the intimate relationship of tonsillitis to certain forms of rheumatism, are guaiac and the salicylates. Guaiac is useful both internally and locally, so that its administration in lozenge form is especially appropriate in this disease. For internal use the tincture of guaiac may be given in tablespoonful doses in milk, several times a day. Sodium salicylate is best given as salol in five to ten grain (0.3 to 0.6 gm.) doses, or in combination with some alkali, for instance, as ten grains (06. gm.) of sodium salicylate with ten grains (0.6 gm.) of sodium bicarbonate in some simple syrup. This quantity should be administered every two hours during the first two days, then every four or five hours throughout the course of the disease.

Local treatment

External applications

The local treatment consists in the application of cold externally either by means of a Priessnitz compress, i. e., a linen cloth wrung out of cold water and covered with flannel or, better still, by means of a Leiter coil (see index) through which ice water is flowing. Leeching or blistering the neck are rarely necessary and usually very disagreeable to the patient. Painting the neck with iodine occasionally helps, but this form of counter-irritation is inferior to the use of the Priessnitz compress. Sometimes cold applied to the neck is very objectionable to the patient; heat may then be applied either by means of hot cloths frequently renewed and covered with oiled silk or by means of linseed-, oatmeal- or bread-poultices. Cold is, however, always more effective in modifying the course of the disease than heat.

Internal applications

Gargles

The tonsils themselves should be treated by means of gargles or by direct applications to the affected glands. The different gargles should be used as follows: A small quantity is taken into the mouth, the head thrown back, the nose closed with the fingers and thumb, the mouth opened and a swallowing movement attempted. The following gargles are useful: A teaspoonful of alum dissolved in half a pint of water, to which is added a teaspoonful or two of some flavoring syrup; or a two per cent. solution of potassium chlorate; or again, the following:

℞

Salicylic acid,	1.0 gm.
Glycerin,	1.0 cc.
Carbolic acid,	1.0 cc.
Water,	100.0 cc.
M.	

If there is pain a gargle of equal parts of lukewarm milk and water to which are added twenty drops of tincture of opium is very soothing.

Sodium carbonate

Ammoniated tincture of guaiac

If the tonsils are very much swollen, or if they are very painful, gargling is difficult and disagreeable. Here direct applications to the tonsils are useful. Dry sodium bicarbonate may be rubbed directly upon the tonsils with the fingers, or the tonsils may be painted or swabbed with ammoniated tincture of guaiac.

Inhalations

Sprays

Inhalations through a steam inhaler of a one per cent. solution of sodium bicarbonate to which are added a few drops of tincture of opium; or spraying the tonsils with a solution of five grains of menthol in an ounce of alboline, are soothing measures. If there is much mucus from complicating pharyngitis, then ice cold lemonade sucked through a straw frequently aids in expelling it.

Evacuation of pus by incision

If suppuration becomes established then nothing in the nature of lozenges, inhalations, sprays or local application should be used. Here evacuation of the pus by incision becomes necessary. The indications for the surgical treatment of tonsillitis are the following:*

Indications for surgical treatment of tonsillitis

"First. Never to inflict unnecessary pain by useless scarification of the surface of the tonsils undergoing general inflammation.

"Second. Never to make deep incisions unless there is almost certainty of advanced suppuration. The instrument for making the incision should be a curved, pointed bistoury with not more than one inch of cutting edge, and the cut should be made from without inwards, so as to avoid the not impossible risk of injuring the artery.

"Third. To recommend removal, on subsidence of the attack, of all tonsils chronically enlarged and liable to quinsy.

"Fourth. To remove the tonsils as soon as they become sufficiently enlarged, in those cases of recurring quinsy in which there is not chronic enlargement, but in which the tonsil though diseased is too small for excision except on recurrence of the acute inflammation. By this means, the present attack is at once cut short and the chance of further recurrence is avoided."

II. DISEASES OF THE NOSE AND THROAT.

ACUTE RHINITIS AND PHARYNGITIS.

Catarrh of the nose and pharynx can fitly be discussed together because both these regions are commonly affected simultaneously or consecutively, and because the general treatment of acute rhinitis and pharyngitis is in all essentials identical.

Catarrh of the upper air passages is rarely produced by direct irritation of the mucous linings of the nose and throat, although what may be called chemical forms of catarrh occur. The treatment of the latter form, when the catarrhal condition is once fairly established, does not materially differ from that of other forms that are due to constitutional causes.

Causes

The most common cause of catarrh of the upper air passages is exposure to cold. The nose and throat are a *locus minoris resistentiæ*, partly on account of their exposed condition and partly owing to the fact that they are chronically in a state of irritation from the inhalation of dust or tobacco smoke, from contact with alcohol, hot foods, spices, or from irritation by excessive use of the voice. Moreover, there is frequently present in these passages a condition of passive hyperemia due to abdominal plethora and tympanitis induced by errors of digestion and liver disorders, gastroptosis and chronic constipation; or due to the wearing of tight collars and neck bands. Inasmuch as the blood vessels of these parts are, moreover, especially susceptible to reflex vaso-motor influences that may originate in many different parts of the body, it is not surprising to find the nose and throat particularly liable to inflammation as soon as the body is exposed to any influence as, for instance, sudden temperature changes, that tasks the adjusting powers of the vaso-motor system.

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*Quoted from Lennox Browne.

Action of exposure to cold

It is a well known fact that, normally, exposure of any part of the body to cold produces, first, a tetanic contraction of the capillaries of the exposed area; second, a reactive dilatation beyond the normal calibre of the blood vessels; third, a restoration of the vessels to their original calibre. Unless the vaso-motor apparatus is functionating in an altogether normal manner, the primary contraction may not occur at all or it may occur promptly, but last too long. In either case the secondary dilatation, which fulfills the purpose of carrying an increased amount of blood to the exposed portion and hence maintaining its temperature, does not take place and the first stage of inflammation is produced. This effect is frequently exercised in the nose and throat and a catarrh produced in this way. Besides, cold affecting certain remote regions of the body, especially the feet, the back of the neck and the region between the shoulder blades, by a peculiar reflex mechanism that is not well understood, readily deranges the vascular supply of the mucous lining of the upper air passages and again catarrh is the result. Hence, as is well known, a draft about the feet, the back of the neck or between the shoulder blades, in susceptible subjects, rapidly produces congestion of the nose and the throat, in other words, a ‘‘cold in the head.’’

Prophylaxis

In order to counteract this tendency to catch cold, the various causes that determine it must be attacked. An intelligent and efficient prophylaxis can here be instituted by removing, primarily, local causes of chronic irritation and, next, by ‘‘hardening’’ the organism with an unstable vaso-motor system against abnormal reactions to cold.

The first condition can be fulfilled by eliminating, as far as that is possible, all the factors that have been enumerated above and that are known to produce irritation of the nose and throat. Here, too, the correction of deformities, the removal of hypertrophies, adenoid tissue, etc., must be regarded as a useful prophylactic measure.

dening.’’

The ‘‘hardening’’ process must be carried out carefully and with due consideration of individual peculiarities. It should properly begin in infancy, and babies from the first weeks of life should be accustomed to the use of cold water. In adults suffering from frequent nasal catarrh, it is never safe to begin at once with cold sponging or bathing, so that the best plan, especially in weak individuals and in all subjects, is to begin with dry rubbing of the skin carried on for two or three minutes every morning. Later alcohol may be employed to rub the surfaces of the body, then warm and lukewarm water and still later cold water. The best way to accustom weakly individuals to cold water is to place them into a warm bath of about the body temperature and while friction of the body is being performed, to gradually cool off the temperature of the water. It will be found that from day to day the temperature can be reduced a few degrees without discomfort to the patient until, finally, cold water can be employed from the beginning. Warm baths alone never harden. Strong and healthy individuals, in whom the reaction to cold is very energetic can, of course, with impunity begin at once with the use of cold sponging or cold plunges even in the coldest weather. Sea bathing, provided the individuals do not stay in the water more than two or three minutes, that is, until the first reaction appears, is also useful in strong people.

Cold bathing

Clothing

The matter of clothing is of great importance. Most people dress too warmly. The underwear should consist of wool, silk or flannel, never of linen or cotton. Linen absorbs the moisture quickly and permits its too rapid evaporation; as soon as it becomes wet, it clings to the body and obliterates the layer of warm air between the skin and the first garment that is so effective as a non-conductor of heat in preventing loss of heat from the body surfaces. Wool is a poor conductor of heat and gives off the absorbed water very slowly. The fine hairs it contains hold the material at some distance from the skin so that a layer of air is always present between the skin and the wool. Its rough texture, moreover, causes some friction and [illegible] hyperemia of the skin, which is grateful to the patients and renders them less liable to catch cold when they pass from a warm room into the cold air. Silk and flannel do not absorb moisture so well as wool, but they are very poor conductors of heat and as they do not irritate the skin they do [illegible] quite so much perspiration as wool. Chest [illegible] protectors and mufflers should be eschewed. The [illegible] accustomed to exposure to cold as well as the [illegible] dangerous form of wear that can be worn [illegible] of course, [illegible] for it produces profuse sweating [illegible] sorbing any of the moisture and hence [illegible] heat wherever worn.

[illegible] perature

The temperature of the living room should [illegible] from sixty-five degrees Fahrenheit. The [illegible] ceptible to catching cold should accustom himself to sleep in a cold room, preferably wearing a flannel night-dress and a night-cap to protect himself from drafts, and should keep warm by using plenty of covers, sleeping between flannel sheets if necessary.*

All the measures enumerated above are particularly useful if there is a congenital predisposition to catching cold, or if such a predisposition has been acquired by frequent attacks of catarrh, or after some infectious disease. In many individuals a general neurasthenic or hysteric condition will be discovered with abnormal sensibility of the nervous system, or there may be chronic anemia that must be corrected (see page 76), for in all these cases there is apt to be a perversion of normal vaso-motor reactions that must be incriminated with producing an abnormal tendency to react by nasal or pharyngeal catarrh to exposure to sudden temperature changes.

TREATMENT OF THE ACUTE ATTACK.

Abortive treatment

Camphor
Opium
Atropine

Foot baths

Dover's powder and quinine and aspirin

Upon the appearance of the prodromal symptoms such as headache, a feeling of fullness in the frontal region, a little chilliness or fever and oozing of a clear fluid from the nose, with conjunctival irritation, it is occasionally possible to abort the attack by the use of camphor, opium and atropine. It is always worth while to attempt this abortive treatment by giving three drops each of the tinctures of belladonna and opium in half an ounce of camphor water, at three hour intervals, for three or four doses. In addition to this internal medication the patient should take a hot mustard foot bath and apply a mustard plaster to the back of the neck. In the evening before retiring five grains of Dover's powder with three grains of quinine and three grains of aspirin should be administered in capsule, together with a glass of hot lemonade containing two tablespoonfuls of whisky; the patient should go to bed and be covered with wollen blankets until profuse sweating is produced.

Treatment of the established attack

Symptomatic treatment

It is very difficult to abbreviate the attack after the catarrh is once fully established. After the first attempt at aborting the attack by sweating has been made it is useless to try to influence the duration of the disease by further diaphoresis. Symptomatic relief may, however, be secured by using a mixture of one part of menthol to ten parts of chloroform and placing a few drops of this solution into the hand and sniffing the vapors at frequent intervals. It is also well to thoroughly wash out the nose two or three times a day with some alkaline solution, such as the following:

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*See also Open Air Treatment of Tuberculosis on pages 313-315.

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The room temperature

The temperature of the living room should vary but little from sixty-five degrees Fahrenheit. The individual who is sus-

Avoidance of straining efforts

ing effort then all the factors that determine the straining, i. e., coughing, vomiting, hard defecation, should be removed and appropriate treatment undertaken against any underlying chronic respiratory or gastro-intestinal disorder that may be present.

Dangers of ergot

A word of warning may be expressed in this place against the use of ergot in nose-bleed. This drug is commonly recommended for the arrest of hemorrhage anywhere in the body, and while it is of marked value in the arrest of uterine hemorrhage, it is doubtful whether it is efficacious in epistaxis. I believe it does more harm than good in nose-bleed, even in those cases in which it is desired to cause constriction of bleeding arteries; in all the other cases of nose-bleed in which the hemorrhage occurs from bleeding veins and capillaries, or in which the hemorrhage is due to diapedesis of blood through degenerated vessel walls, its use is at least superfluous, for ergot usually produces a slight rise of the blood pressure. Ergot, moreover produces blood vessel constriction only in certain definite areas and the nasal mucosa does not happen to be one of the regions in which the drug exercises this effect on the vascular supply. As a matter of fact I have never been satisfied that it acts beneficially in nose-bleed or in pulmonary hemorrhage (see also page 310).

Opium Morphine Chloral not to be used

Opium and morphine and members of the chloral group should also always be avoided in treating cases of nasal hemorrhage. The temptation to give these remedies is great as the patients are often restless and frightened and one might think of giving them as sedatives in order to quiet this excitement. Opiates, however, reduce the tone of the vaso-motor center in the medulla and hence cause vaso-dilation and consequently congestion, especially about the head. Witness the flushing of the face after the exhibition of opiates, that renders them decidedly harmful in hemorrhages from the nasal mucosa (see also page 310). The drugs of the chloral group exercise a similar effect, for they too produce paralysis of the vaso-motor nerves and induce peripheral congestion.

Causal treatment in infectious and toxic epistaxis

The causal treatment of nasal hemorrhage, due to anemia, leukemia, various infections, auto-intoxication in hepatic and gastro-intestinal disorders and in poisoning by different drugs is in all particulars the same as the treatment of the underlying disorders and need not be discussed again in this place. It is frequently difficult to determine whether the nose-bleed is due to the toxemia direct, i. e., to changes in the composition of the blood, or to degenerative changes in the vessel walls of the

Abortive treatment
Morphine and atropine

the attack one-twenty-fourth grain of morphine with one-two-hundredth grain of atropine should be given every two hours for four or five doses. Local applications do no good whatsoever.

Prophylaxis of hay fever

The treatment of hay fever and of pseudo hay fever is a very ungrateful task when the attack is once established. An intelligent prophylaxis, however, may aid very much towards preventing the recurrence of attacks of hay fever, or at least towards rendering the seizures less severe and less protracted. In the first place the mucous lining of the nose must be carefully treated during the winter, hypertrophies, varicose veins, deformities, etc., being corrected. More important than this, however, is the treatment of the underlying neurotic, i. e., neurasthenic or hysteric, temperament. Here, hydrotherapeutic measures, a course of arsenic or strychnia or phosphide of zinc, and all the measures described in detail in the Section on *Gastric Neuroses* have an important place. Sufferers from hay fever, as is well known, obtain the greatest relief, or even complete immunity from attacks, by a change of climate. Most mountain climates and the shores of Lake Superior, Lake Huron and the northern shores of Lake Michigan enjoy a well merited reputation as hay fever resorts.

Opium and belladonna
Menthol-camphor

Symptomatically, in order to reduce the violent coryza, the conjunctivitis and the asthma in patients who cannot go away, opium and belladonna, in two or three drop doses of the tinctures, may be given three or four times a day. Often small doses of atropine, one-two-hundredth grain, are useful, also given three or four times a day. The menthol-cocaine mixture, described on page 269, may be inhaled, or smelling salts of the following formula be used with considerable relief to the patient:

℞

Carbolic acid,	30 drops
Ammonium carbonate,	1 ounce
Charcoal powder,	1 ounce
Lavender oil,	20 drops
Compound tincture of benzoin,	½ ounce

M. Sig. Smelling salts.

—(Lennox Browne.)

Sprays

Sprays of adrenalin, morphine, salicylic acid, cocaine, capsicum, etc., have all been recommended, but their effect is very transitory and, as a rule, injurious to the nasal capillaries, especially if used continuously. Their use had best be eschewed altogether or reserved for emergencies when it becomes necessary to grant temporary relief. The use of Dunbar's "Hay Fever Serum" is still in the experimental stage, but promises something. It is too early to render judgment in regard to its efficacy.

Dunbar's hay fever serum

EPISTAXIS.

Epistaxis of mechanical origin

Nose-bleed is an important symptom of manifold origin that the internist is frequently called upon to treat. Those forms of epistaxis that are due to mechanical injury of the blood vessels of the nasal mucosa of necessity call for topical or surgical treatment. To this category belong cases of epistaxis that follow trauma, especially fracture of the base of the skull, rupture of the sinuses, etc.; epistaxis occurring as a complication of tumors, malignant or otherwise, of the nose or its accessory cavities whose surfaces within the nose undergo ulceration with resulting erosion of superficial arteries; and epistaxis from ulcers of the nasal cavity due to syphilis, lupus and other causes.

Epistaxis of constitutional origin

In addition to this mechanical form there are important forms of epistaxis that are due to constitutional causes. In the first place any of the manifestations of the hemorrhagic diathesis, notably hemophilia, scurvy and purpura, as well as any of the severe anemias and leukemia, can produce hemorrhage from the nose. Here the hemorrhage is rarely profuse but generally consists of slow and continuous oozing with the formation of large clots and hematomata. In most of these cases one must assume that diapedesis of blood occurs through vessel walls weakened and rendered permeable to blood plasma and corpuscles by nutritional disorders of their tissues; now and then these degenerative changes produce fragility and rupture of arterioles with more profuse bleeding.

Epistaxis in infections and intoxications

To the same class undoubtedly belong those forms of nasal hemorrhage that occur as a part phenomenon of various infections and intoxications. Thus in typhoid fever, in most of the exanthemata and in yellow fever, nose-bleed is common; in hepatic cirrhosis and acute yellow liver atrophy, also phosphorus liver, in gout and in diabetic acidosis epistaxis may occur. The exact explanation of this phenomenon is still forthcoming, presumably, however, one is dealing with degenerative processes occurring in the vessel walls superinduced by the action of circulating bacterial toxins or of poisonous products of perverted metabolism.

Epistaxis in disease of the cardio-vascular apparatus

A third variety of cases of epistaxis occurs in diseases of the cardio-vascular apparatus accompanied by high arterial pressure with fragility of blood vessel walls or profound venous stasis as, for instance, in arterio-sclerosis, in syphilitic arteritis, chronic alcoholism, and lead-poisoning.

In valvular diseases of the heart in the stage of decompensation, or in tricuspid lesions before the balance of compensation is broken, hemorrhage from profound venous stasis about the nasal mucosa is apt to occur. In this group of cases hemorrhage from the nose rarely takes place spontaneously but is usually superinduced by some straining effort; so that hiccough, bronchitis, emphysema, nausea, vomiting from whatever cause, constipation and all other disorders that force the patient to strain must be considered determining causes of nose-bleed in predisposed subjects.

Epistaxis and sexual disorders

Finally there is an interesting class of cases of epistaxis related to disorders about the sexual apparatus. It is well known that irritation of the sexual sphere can produce turgescence of the corpora cavernosa of the turbinates; that inversely stimuli applied to the nose influence the sexual sphere, so that certain odors exercise a peculiarly stimulating effect upon the *libido sexualis;* that treatment of the nose, especially cocainization of certain sensitive areas, can occasionally exercise a profound effect upon dysmenorrhea. It is not surprising, therefore, to find nose-bleed occurring not infrequently as a part phenomenon of disorders of the sexual sphere. Epistaxis is a common accompaniment of excessive masturbation; it is especially frequent during the age of puberty in individuals of both sexes and it not infrequently accompanies menstruation or takes its place, so that it has been characterized in these instances as a vicarious form of menstruation.

To treat epistaxis, especially chronic recurrent or particularly obstinate, continuous forms of the disorder, successfully all these causative factors must be thought of, the exact etiology determined and causal treatment instituted accordingly.

Topical treatment

Epistaxis due to purely local causes, violence, trauma, tumor, ulceration, chronic nasal catarrh with erosion of arterioles, calls for appropriate topical treatment. In post-operative and traumatic nose-bleed it is a good general rule not to be in too great a hurry to stop the nasal hemorrhage by active interference, as most cases of traumatic epistaxis have a tendency to become spontaneously arrested, and the hemorrhage is rarely so profuse as to endanger life; with the loss of blood, moreover, the coagulability of the blood increases. The simplest measures that

Ice compress and ice water injections

should be tried, if the hemorrhage does not cease spontaneously within a reasonable time, are the application of ice to the outside of the nose (pressing a piece of ice against the side of the nose near the bridge) and the injection of ice water into the bleeding nasal cavity. If possible tampons should be avoided in these cases, as they are exceedingly disagreeable to the patient during the days they have to remain in place and may cause new bleeding from tearing of the clot or cicatrix when they are removed.

Cauterization of the bleeding spot

If the hemorrhage is very profuse and the patient becomes rapidly exsanguinated so that one is justified in assuming that an artery has been ruptured or eroded, then every effort should be put forward to find the bleeding spot. If the bleeding area can be located, after cleansing the nose of blood, it should be touched with trichloracetic acid, a stick of silver nitrate, tannin powder or a strong solution of hydrogen peroxide or, if necessary, with the actual cautery, remembering always that the latter should be removed while hot, as otherwise the clot becomes adherent to the instrument and may be torn off again.

Tamponade

Digital compression

Plugging of posterior nares

If it is impossible to stop the hemorrhage in this way, then tamponade of the nose becomes necessary. The application of the simple aseptic cotton, or better still, of iodoform gauze, should be preferred to the use of cotton saturated with cocaine (5 per cent.) or antipyrin (10 per cent.) or ferric chloride solutions; especially the latter should be avoided for its styptic effect is slight, the clot that is formed is very fragile and, above all, the tampons become very slippery and are apt to drop out. Provided simple packing of the nose with cotton or iodoform gauze, combined with digital compression from without, do not stop the bleeding, then it becomes necessary to plug the posterior nares with a Bellocq canula according to the methods described in special works on disorders of the nose and throat and in text books on surgery.

General management

Position

Ligating extremities

Supporting the heart

While these local measures are being applied the general management of violent nasal hemorrhage is the following: The collar or neck-band should be loosened; the patient should not be allowed to stoop over and should be put to bed in a semi-recumbent position with the head high or thrown back. Often holding the hands over the head is a useful measure. It may become necessary to ligate off the extremities with bandages in order to reduce the volume of blood streaming to the head. If the blood pressure falls from loss of blood and the pulse becomes small and weak, a hypodermic injection of camphorated oil, or of camphor in ether, or of ether alone, must be given for their analeptic effect (see page 32). The management of post-hemorrhagic anemia is fully described on page 76.

Treatment of epistaxis in arterial disease

In the other forms of nose-bleed that are not due to injury or erosion of larger blood vessels in the nose, the following plan of treatment should be adopted: In cases that are accompanied

Aconite
Veratrum
Nitroglycerin
Erythral tetranitrate

by high arterial tension, notably in cases of cardio-vascular and renal disease, in syphilitic arteritis and arterio-sclerosis, an effort should always be made to discover the bleeding point in the nose. In the majority of cases the hemorrhage occurs from the septal artery at a spot near the anterior part of the septum. In this region spurs are often found, so that here the mucosa is often attenuated and foreign bodies can also readily lodge and cause local erosions. While every attempt is being put forward to stop the hemorrhage locally by direct treatment of the bleeding spot (see above), by ice water injections, by packing with pledgets of cotton or iodoform gauze combined with digital compression and the application of ice externally; while the patient is instructed to hold his arms over his head and to follow the other general rules in regard to position that have been described above; an attempt should also at once be made to lower the blood pressure by giving drop doses of the tincture of aconite or of veratrum viride every half hour for three or four doses, or better still by giving one single dose of three to five drops of aconite tincture in water at once, followed later by one-hundredth grain doses of nitroglycerin, repeated once or twice, or by one dose of one grain (0.05 gm.) of erythrol tetranitrate.

Treatment of epistaxis due to venous stasis
Digitalis
Analeptics
Mustard foot baths

If the blood pressure is not high and if the epistaxis is due to simple oozing from congested veins or from rupture of venules or capillaries on the surface of the nasal mucosa, and if this venous congestion is due to decompensated heart lesions, or tricuspid insufficiency without decompensation, then the use of digitalis in five drop doses of the tincture, repeated three or four times at one hour intervals or, better still, of camphor, ether, ammonia or other analeptics (for exact mode of administration, see page 32), is indicated. Here the patient should sit up and place his feet in hot water medicated with mustard, about three or four teaspoonfuls to a gallon of water.

Hydrastis
Cotarnine
Venesection

The best internal remedy aside from cardiac tonics is hydrastis in twenty to thirty drop doses of the tincture, repeated several times, or as hydrastinine hydrochlorid in doses of one-half to two grains (0.03 to 0.13 gm.), in watery solution, by mouth or hypodermically. Cotarnine (stypticine) in the dose of one-third to one-half grain (0.02 to 0.03 gm.) may be administered in the same way. Combined with these measures simple local treatment with ice water, digital compression and, if necessary, packing with cotton may be tried. Sometimes, too, venesection and the withdrawal of 200 to 300 cc. of blood is a very useful procedure. If the bleeding from the nose occurs frequently in such cases and if it is generally superinduced by some straining effort then all the factors that determine the straining, i. e., coughing, vomiting, hard defecation, should be removed and appropriate treatment undertaken against any underlying chronic respiratory or gastro-intestinal disorder that may be present.

Avoidance of straining efforts

A word of warning may be expressed in this place against the use of ergot in nose-bleed. This drug is commonly recommended for the arrest of hemorrhage anywhere in the body, and while it is of marked value in the arrest of uterine hemorrhage, it is doubtful whether it is efficacious in epistaxis. I believe it does more harm than good in nose-bleed, even in those cases in which it is desired to cause constriction of bleeding arteries; in all the other cases of nose-bleed in which the hemorrhage occurs from bleeding veins and capillaries, or in which the hemorrhage is due to diapedesis of blood through degenerated vessel walls, its use is at least superfluous, for ergot usually produces a slight rise of the blood pressure. Ergot, moreover produces blood vessel constriction only in certain definite areas and the nasal mucosa does not happen to be one of the regions in which the drug exercises this effect on the vascular supply. As a matter of fact I have never been satisfied that it acts beneficially in nose-bleed or in pulmonary hemorrhage (see also page 310).

Dangers of ergot

Opium and morphine and members of the chloral group should also always be avoided in treating cases of nasal hemorrhage. The temptation to give these remedies is great as the patients are often restless and frightened and one might think of giving them as sedatives in order to quiet this excitement. Opiates, however, reduce the tone of the vaso-motor center in the medulla and hence cause vaso-dilation and consequently congestion, especially about the head. Witness the flushing of the face after the exhibition of opiates, that renders them decidedly harmful in hemorrhages from the nasal mucosa (see also page 310). The drugs of the chloral group exercise a similar effect, for they too produce paralysis of the vaso-motor nerves and induce peripheral congestion.

Opium Morphine Chloral not to be used

The causal treatment of nasal hemorrhage, due to anemia, leukemia, various infections, auto-intoxication in hepatic and gastro-intestinal disorders and in poisoning by different drugs is in all particulars the same as the treatment of the underlying disorders and need not be discussed again in this place. It is frequently difficult to determine whether the nose-bleed is due to the toxemia direct, i. e., to changes in the composition of the blood, or to degenerative changes in the vessel walls of the

Causal treatment in infectious and toxic epistaxis

nasal mucosa, or to general cardio-vascular changes (high blood pressure, venous stasis, etc.) produced by the circulating poisons.

It is well to remember that occasionally nose-bleed is a useful means adopted by Nature to relieve plethora, especially in individuals suffering from stasis due to decompensated heart lesions and in subjects of an apoplectic habit. Here the shedding of blood from the nose is a safety-valve action and one of Nature's means of defense against more serious injury. In such instances the physician must frequently exercise his best judgment in regard to the advisibility of stopping the hemorrhage at once or of allowing some blood to escape before endeavoring to arrest the flow. If the conditions are such that venesection would have been indicated, then no effort should be made to stop the nose-bleed too soon.

By the same sign bleeding the patient from the arm may occasionally be efficacious in forestalling disagreeable vicarious menstruation from the nose. In some of these cases hemorrhoidal bleeding occurs instead of epistaxis, so that if it is desired to stop or prevent the nose-bleed, leeches to the anus often accomplish this purpose if leeching is performed immediately before and during the time of the menstrual period. Hot vaginal douches or a hot sitz-bath; free evacuation of the bowels by a saline laxative; tincture of cimicifuga, in five drop doses, every four hours, during the two or three days preceding the expected menstruation, Pil. Aloes et Ferri five grains (0.3 gm.) two or three times a day, or Pil. Aloes et Myrrha in the same dose, occasionally aid in overcoming the amenorrhea and in preventing vicarious epistaxis.

ACUTE LARYNGITIS.

The prophylactic and internal treatment of acute laryngitis is essentially the same as that of acute rhinitis and pharyngitis (page 265). Upon the first appearance of the prodromal symptoms, sweating, mustard foot baths and the combination of quinine, Dover's powder and aspirin, as described on page 268, with hot whisky lemonade should be given. The bowels should be thoroughly evacuated upon the onset of the attack by the use of calomel given in one-tenth grain doses for ten doses in the evening, and followed in the morning by a tablespoonful of magnesium sulphate in water.

As soon as secretion becomes established mild expectorants (see page 281) may be given. The following expectorant mixture is very useful:

℞

Ammonium carbonate,	5 grains
Tincture of scilla,	10 drops
Compound tincture of camphor,	15 drops
Syrup of ginger,	1 drachm
Infusion of serpentaria, q. s.,	1 ounce

M. Sig. Expectorant mixture.

—(Browne.)

Cold compress

A very practical adjuvant to the treatment and one that alone, better than any other means, often suffices to bring about quick relief and to hasten restitution to normal conditions, is cold about the throat applied by means of the Leiter coil or a handkerchief wrung out of cold water, placed tightly about the throat and covered with a woolen or flannel bandage. It may be left on over night and renewed again in the morning; or, if the patient remains at home, applied several times during the day.

Moist atmosphere

Inhalations

The atmosphere of the room should be saturated with moisture from a steam kettle. Inhalations of steam medicated with equal parts of a mixture of oil of terebinth, juniper and eucalyptus, or compound tincture of benzoin, may be used as follows: A teaspoonful of the mixture of the three oils, or of the benzoin, is mixed with a quart of boiling water in a dish; the patient's head and the dish are covered with a thick cloth and the rising vapors inhaled deeply for five to ten minutes at a time, three or four times a day. Or the inhalations may be made through a paper cornucopia, the large end of which is held over the dish of hot water. Special steam inhalers may also be used to advantage and here any of the etherial oils mentioned above, particularly oil of terebinth, the oleum pumilionis, or the oil of juniper are useful. In case of severe pain and difficulty in swallowing ten to fifteen drops of opium tincture may be added to the inhaling fluids.

In the later stage of the disease when the mucus becomes tough and difficult of expectoration, inhalations through a steam vaporizer of a 1 to 2 per cent. solution of common salt, or of sodium bicarbonate, are exceedingly useful, and here again the addition of a few drops of opium tincture will relieve the soreness in the throat better than any means that I know of.

Intra-laryngeal applications

Intra-laryngeal applications are rarely necessary unless there is very great hoarseness, or much pain with burning and dryness and difficulty in swallowing. A useful laryngeal spray containing cocaine and bromide of potash, is the following:

℞

Muriate of cocaine,	0.03
Bromide of potash,	10.00
Distilled water,	300.00

M.

Insufflation of alum

Better still, however, is the insufflation of a powder consisting of equal parts of alum and sugar of milk. The latter should, however, only be used as an emergency measure to stop hoarseness and aphonia in an individual, for instance, who has to use his voice for two or three hours despite the existence of laryngeal catarrh.

Cleansing the nasal passages

Symptomatically, the thorough cleansing of the nasal passages with an alkaline wash, followed by a menthol and alboline spray, as described under *Rhinitis,* is often followed by good effects upon the laryngitis.

CHAPTER VII.

DISEASES OF THE BRONCHI, LUNGS AND PLEURA

I. DISEASES OF THE BRONCHI.

ACUTE TRACHEO-BRONCHITIS.

In acute catarrhal bronchitis there is always, first, hyperemia of the mucous lining of the bronchial tubes followed by degeneration of the superficial epithelia, then an outpouring of a serous transudate with swelling of the mucosa and narrowing of the lumen of the bronchial tubes and, last, loosening and desquamation of the epithelia that have undergone degeneration. Clinically, it is convenient to distinguish two stages, viz., what may be called a dry and a wet stage, the former being the stage of hyperemia, the latter the stage of profuse exudation of serum and casting off of degenerated epithelium. The object of the treatment in acute bronchitis must be, if possible, to abort the attack while it is still in the dry, hyperemic stage, or, if this fails, to convert the first into the second stage as rapidly as possible.

Classification

Prophylaxis

Prophylaxis can be exercised merely in rendering the individual less susceptible to temperature changes or other extraneous influences that determine bronchial catarrhs. Here the same rules in regard to clothing, diet, bathing, exercise, etc., obtain as in the prophylactic treatment of catarrh of the upper respiratory passages, and I refer to the chapter on these disorders for the details.

Abortive treatment

Upon the onset of the first signs of bronchial catarrh, viz., a sense of dryness, irritation or pain behind the sternum and along the distribution of the larger bronchial tubes, a saline laxative should be administered and the patient should take a dose of three grains (0.2 gm.) of quinine sulphate, and drop doses of the tincture of aconite every hour for five or six doses. Hot lemonade, with a tablespoonful of brandy or whisky to the tumblerful, should be freely taken. A general hot bath of 100° to 105° F., provided the patient can go to bed afterwards and sweat between woolen blankets, is very useful. Turkish baths, which are very popular, are dangerous unless the patient can remain in the bath establishment over night. It is rarely necessary to give pilocarpine to produce sweat, as the hot bath, with hot alcoholic drinks, possibly a ten-grain Dover's powder, suffice to produce the desired vaso-dilator and diaphoretic effect. After an hour or two of profuse sweating the patient should be carefully dried and put back to bed between dry, warmed linen sheets.

The treatment of the dry stage

If these measures do not abort the attack, then every effort should be put forward to soothe the inflamed mucosa and, at the same time, promote outpouring of fluid from the bronchi; in other words, to relieve the dryness and hasten the development of the second stage. This object can be accomplished by inhalations, the use of opiates and alkalies internally, and stimulating compresses externally.

Inhalations

Inhalations of physiological salt solution, or of 2 to 3 per cent. sodium bicarbonate solution, through a steam inhaler are very useful. Instead of using a steam inhaler the patient may hold his head, covered with a cloth, over a dish of boiling water, to which may be added tincture of benzoin (one drachm to one pint), a few drops of opium tincture, or of extract of belladonna; the latter especially if the cough or the retrosternal pain is very severe. In children the bronchitis tent serves a very useful purpose. It is constructed by hanging over the bed sheets supported either by a special rack or by a screen. Within the tent a kettle of water is kept boiling by means of an alcohol lamp. In this way the child continuously breathes air that is saturated with moisture, and a very soothing effect upon the inflamed mucous membranes of the bronchial tubes can be obtained in this simple manner.

Bronchitis tent

Opiates

Internally some opiate will generally have to be given to allay the cough, preferably morphine, in the dose of one-thirty-second to one-twelfth of a grain, or codeine one-sixteenth to one-fourth grains. The numerous other opium derivatives, as heroin, dionin, peronin, etc., possess no advantages over morphine and codeine. Hyoscyamus, stramonium, belladonna and other members of the atropine series are best reserved for the stage of profuse secretion, for while they act as sedatives and relieve bronchial spasm they also check secretion and the latter effect is undesirable during the dry stage of bronchitis. Alkalies, administered in the form of citrates, acetates or carbonates of potassium or sodium, in doses of ten to thirty grains (0.6 to 2 gm.) at four or five hour intervals, in milk or water, or in the form of mineral waters, act very beneficially at this stage. It is possible that they are in part excreted by way of the bronchial mucosa hence causing some irritation with outpouring of secretion. Their exact mode of action is not all understood, but empirically we know that they act very beneficially.

Atropine series

Alkalies

Counter-irritation over the chest

One of the most useful adjuvants to the treatment of this stage of bronchitis is counter-irritation over the chest, preferably

Cold compress

administered by the use of cold compresses. A linen bandage about three yards long and six inches wide is dipped into water of room temperature and thoroughly wrung out. One end of the binder is applied to the right axilla, the binder carried across the chest to the left shoulder, across the back to the right axilla, across the chest to the left axilla, across the back to the right shoulder and then to the middle of the chest. A second cross bandage of dry flannel is then applied over the first one and the dressing left in place until it is dry, which usually requires four or five hours. A second wet pack may then be applied, or the skin may be washed with alcohol and rubbed dry. It is unnecessary to apply an impermeable oil-silk or rubber dressing over the wet bandage; if the binder is to be left on all night the patient may wear a woolen shirt rather than a flannel bandage over the cross bandage. Mustard plasters, dry cups, iodine and camphorated oil, are not as effective as this simple means.

Plaster, cupping, iodine, camphor

Treatment of the wet stage

As soon as the dry, hyperemic stage is over and an exudation of mucus from the bronchial mucosa has begun, then the treatment becomes radically different. Three main indications must now be met, namely, first, to promote liquefaction of the sputa; second, to aid their expulsion; third, to allay excessive coughing and to relieve the pain in the chest.

Liquefaction of the sputa

Alkalies

A number of remedies can be employed to produce liquefaction of the sputa. As already indicated above, alkaline or saline waters serve this purpose. They should be taken warm at frequent intervals and in abundant quantities, either alone or mixed with milk.

Ammonium chloride

Probably the most useful remedy in this condition is chloride of ammonium. It is not improbable that this drug is in part excreted via the bronchial mucosa, so that it acts locally as a slight stimulus to the bronchial epithelia and produces a reactive outpouring of serum; besides, ammonia salts exercise a stimulating effect upon the respiratory centres in the medulla and hence aid in the expulsion of the mucus. The dose of ammonium chloride varies from five to fifteen grains (0.3 to 1 gm.)and it should be given at three or four hour intervals. A very convenient and useful way of administering it is in solution in Mist. Glycrrhizæ Comp. (see page 283).

Emetics

Emetics, given in small doses, produce a copious transudation of bronchial mucus and of saliva. They are all very useful, therefore, if the bronchial secretion is tough and viscid and thus difficult of expectoration, but they should never be used when the secretion of the bronchial tubes is abundant. Nor should they ever be given to sufferers from heart disease (see page

Ipecac

Apomorphine
Tartar emetic

38) or from catarrh of the stomach. The most useful members of this group are ipecac, most conveniently given in the form of Dover's powder, five grains, several times a day; or as syrup of ipecac in one-half to one teaspoonful doses; apomorphine, given in doses of one-twentieth to one-tenth of a grain (.03 to .06 gm.); and tartar emetic, in doses of one-thirtieth to one-eighth grain, two or three times a day.

Turpentine

Turpentine is also useful at this stage; it should be given in ten to twenty drop doses in a tablespoonful of milk and half a glass of milk taken immediately afterwards. If the patients cannot take the milk, five to six drops of turpentine may be placed upon a piece of bread and butter and the drug taken in this way. The milk and the butter prevent the irritating effects of turpentine upon the gastric mucosa. Agreeable preparations of turpentine are terpene hydrate, which can be given in daily doses of 0.2 to 0.5 gm., acceptably in dilute alcoholic solution with some simple syrup; terpinol, in three grain doses, four or five times a day, in capsule with two or three parts of olive oil.

Terpene hydrate
Terpinol

Balsams of Peru and tolu
Sodium benzoate

The balsams of Peru and tolu are very popular in the treatment of bronchitis. They all contain benzoin or its derivatives, hence sodium benzoate belongs to the same group. Balsams of Peru and tolu should be given in an emulsion or as a mucilage in doses of five to fifteen grains (0.3 to 1 gm.) several times a day. The syrup of tolu is particularly useful as a vehicle for ammonium chloride, emetics or opiates, but it contains very little of the balsam so that it is itself practically inert. Benzoate of soda is generally very useful; it should be given in five to thirty grain doses (0.3 to 2 gm.) two or three times a day.

Volatile oils
Copaiba
Cubebs
Santal oil

Certain of the volatile oils, as copaiba, cubebs and santal, may also be given at this stage. Copaiba, in the form of the oleoresin, in capsule, in doses of ten to twenty drops (0.6 to 1.3 cc.); cubebs also as the oleoresin, in doses of ten to fifteen minims (0.6 to 1); and santal oil in the same dose, several times a day. Turpentine and the balsams are apt to irritate the stomach and the kidneys and hence they should be administered with care and their use discontinued at once upon the appearance of signs of gastric or renal irritation.

Strychnia

In order to aid the expulsion of the mucus strychnia is one of the most effective remedies, for it causes contraction both of the bronchial musculature and of the large respiratory muscles. Strychnia is particularly valuable in cases of bronchitis in which much tough mucus accumulates during the night, so that the patients awake with severe dyspnea. Here the administration of one-thirtieth to one-fortieth of a grain of strychnia before going to sleep frequently prevents these attacks of nocturnal

Senega

dyspnea. Senega, finally, which may be given in doses of ten to twenty drops (0.6 to 1.3 gm.) of the fluid extract, or in the form of the syrup of senega one to two drachms (4 to 8 gm.), may also occasionally be employed in this stage of bronchitis.

Opium and Morphine

Atropine

If the cough is very severe and distressing then it becomes necessary to allay both the irritability of the coughing center and the local sensitiveness in the pharynx. This can best be done by small doses of opium or morphine, preferably given in combination with atropine or belladonna, especially if there is, at the same time, a very active and profuse discharge of bronchial secretion.

Mistura Glycyrrhizae comp.

Cough syrups and cough drops

One of the best standard preparations for internal use at this stage is the Compound Licorice Mixture containing opium, antimony, spirits of nitrous ether and licorice as its chief ingredients. It should be given in one to two teaspoonful doses, several times a day. In order to quiet the local irritation in the throat any demulcent or syrup is useful, and here the innumerable cough drops and cough syrups that are recommended have their field of application.

CHRONIC BRONCHITIS AND BRONCHIECTASIS.

Causal and symptomatic treatment

Chronic bronchitis may develop as a result of repeated attacks of acute bronchitis, or it may be a part phenomenon or complication of heart lesions, arterio-sclerosis, emphysema, obesity, gout, chronic nephritis and other disorders. The chronic inflammation of the bronchial mucosa generally yields to appropriate treatment directed towards removing the underlying cause, as discussed in the section on these different diseases. If the primary affection is irremediable, or if mechanical destruction, *scil.* atrophy of the mucous lining of the bronchi, has occurred, then the treatment of chronic bronchitis of necessity becomes symptomatic. The treatment of the different varieties of chronic bronchitis differs somewhat according to the character of the secretion. From a therapeutic standpoint it is practical to distinguish a dry form of chronic bronchitis in which there is very little secretion; a moist form in which there is very abundant secretion; a form in which the exudate is fibrinous and in which casts of the bronchial tubes appear, and, finally, a purulent or putrid form of chronic bronchitis.

Climate

In all kinds of chronic bronchitis the choice of climate is exceedingly important. In the dry variety a moist, warm climate with the minimum of sudden temperature changes is the ideal, whereas in the moist variety a dry, hot climate is by far preferable. Whatever resort is selected the atmosphere should be free

Mountains
Seashore

from dust. If the subject is anemic, and if there is complicating lung trouble, especially of a tuberculous character, then a moderate altitude is advantageous (see page 318). If there is emphysema and the subject is not anemic, then the sea shore is better. The selection of a proper climate for chronic bronchitis is altogether an exceedingly difficult task, for it must be governed by many individual factors that vary in each patient.

Hydrotherapy

Hydrotherapeutic measures are of particular value in dry forms of chronic bronchitis and enough cannot be said in regard to their efficacy, especially of cold compresses applied in the form of crossed bandages, as fully described in the section on *Acute Bronchitis* (see page 281). These compresses allay the coughing, act as a general sedative to the respiratory centers, liquefy the bronchial secretions and aid in their expectoration.

Alkaline and saline waters

Sulphur waters

Alkalies and alkaline and saline waters are always of value; the latter both on account of their stimulating effect upon the bronchial secretion and their laxative properties; for they effectively relieve abdominal plethora and hence save the right heart much labor, in this way improving the circulation in the lungs. Sulphur waters, too, have an important place in the treatment of chronic catarrhal bronchitis, for part of the sulphur is eliminated via the bronchi as sulphureted hydrogen, producing in its passage active hyperemia of the atonic mucosa, hence improving the circulation in the bronchial wall and also acting to some extent as a local antiseptic.

Medicamentous treatment

The drug treatment of chronic bronchitis varies according to the character of the secretion. In the dry variety remedies should be administered that can aid the liquefaction of the viscid mucus and, at the same time, stimulate the bronchial mucosa; to this group belong ammonium chloride, turpentine, balsams of Peru and tolu, sodium benzoate, copaiba, cubebs, santal oil, ipecac, tartar emetic, apomorphine; whereas in the moist variety drugs should be used that can diminish the excessive secretion and simultaneously favor its expectoration, notably, belladonna, atropine, stramonium, hyoscyamus. All these remedies, with their dose and mode of administration, have been fully mentioned under *Acute Bronchitis.*

Treatment of putrid bronchitis

Inhalations

In purulent and putrid bronchitis, disinfection and deodorization of the foul bronchial secretion can be accomplished either by the inhalation of medicated vapors or by the internal administration of different drugs that are in part excreted via the bronchi. The best method of treating the bronchial mucosa by inhalations is by means of a steam atomizer, using turpentine oil, tincture of eucalyptus, carbolic acid (1 to 3 per cent.), thymol (1 to 2,000), creosote or guaiacol (1 to 2 per cent.), to medicate the vapors. For internal use the balsams of Peru and tolu, sodium benzoate, turpentine and its derivatives (see index), fluid extract of eucalyptus, fifteen to thirty drops, or eucalyptol, five to fifteen drops, repeated several times a day (or sulphur waters), may all be employed.

Drugs

Treatment of fibrinous bronchitis

Iodide of potash

Lime water by inhalation

In fibrinous bronchitis the most effective remedy is iodide of potash, given in increasing doses, beginning with ten drops of the saturated solution in milk, three times a day, and gradually increasing the dose until sixty or more drops a day are being taken. The good effects from iodide of potash may possibly be attributed to the fact that many cases of fibrinous bronchitis are due to syphilis. Inhalation of lime water through a steam atomizer is the best remedy to produce loosening and expectoration of the fibrous coagulates in the bronchi.

Narcotics

Atropine

Strychnine

In many cases of chronic bronchitis it becomes necessary at some stage of the disease to administer narcotics in order to check the severe cough. This is necessary for the comfort of the patient and in order to prevent emphysema and dilatation of the heart, two complications that are certain to supervene unless the coughing is controlled. In view of the chronic character of the disease particular care should be exercised not to create an opium habit, and, for this reason, it is well to frequently change both the preparations of opium as well as their mode of administration, giving at different times opium in tincture or extract, morphine, codeine, heroin, dionine by mouth, hypodermically, in suppository or as a rectal injection. The dose should always be small and it is best if the patient does not know what he is getting. The addition of belladonna or atropine to opium preparations is usually of value. Strychnine also has a place in the treatment of chronic bronchitis, for it aids expectoration by its stimulating effect upon the bronchial musculature, the respiratory centre and the heart.

BRONCHIECTASIS.

Position of patient during inhalations

Bronchiectasis may well be discussed in connection with chronic bronchitis, for the internal treatment and the treatment by inhalation is essentially the same as in the putrid bronchitis. In bronchiectasis certain mechanical features that characterize this disorder must be considered; thus the evacuation of the bronchiectatic cavities is promoted by placing the patient every morning in such a position that the opening into the bronchiectatic cavity, provided there is only one large cavity, points downward. In giving inhalations with the different remedies described above it is always well first to produce evacuation of the cavity in this way and then to let the patient remain in the proper position while inhaling; if this is done, the medicated vapor can come into much more intimate contact with the diseased cavity wall than if the latter is full of excretion. In bronchiectasis narcotics should be withheld, for if the sensibility of the mucosa near the orifice of the cavity or cavities is deadened, the normal coughing effort that results from contact of the putrid material with this area is prevented so that stagnation of the material in the bronchiectatic cavities is favored and the disorder is apt to be aggravated rather than improved.

Danger of narcotics

Operative treatment

The operative treatment of bronchiectasis is still in the experimental stage. Aspiration of bronchiectatic cavities is feasible only if the exact location of the cavity can be determined by physical examination and if the cavity is near the surface. Drainage of the cavity by aspiration, and injection of antiseptic fluids into the cavity. is never without danger; this procedure, moreover, is followed by very indifferent results, and as there is generally more than one bronchiectatic cavity, it is hardly practical. Opening the pleura for the purpose of producing collapse of bronchiectatic cavities has been extensively practised, but I have not been convinced in those cases in which I could study the patients before and after the operation, that the results obtained were sufficiently satisfactory to justify so precarious an inroad.

BRONCHIAL ASTHMA.

Cardiac, renal, uremic, lead, etc., asthma

Many forms of dyspnea that are due to heart disease, nephritis, obesity, diabetes, goutiness and lead-poisoning are commonly included under the name of asthma, with various prefixes such as cardiac asthma, renal asthma, uremic asthma, lead asthma, etc. These symptomatic forms of asthmatic dyspnea usually yield to proper causal treatment directed towards the underlying disorder.

Bronchial asthma

Bronchial asthma proper is a disease *sui generis,* of various etiology. It is characterized by spasm of the bronchial muscularis, generally accompanied by vaso-motor disturbance in the bronchial mucosa, manifesting itself by hyperemic swelling and narrowing of the bronchial lumen, and occasionally by the formation of an exudate in the smaller bronchioles.

Causes

These conditions may be produced, first, by local agencies directly affecting the upper respiratory passages and the bronchial mucosa, as certain forms of dust or pollen and, in predisposed subjects, emanations from certain animals, as well as other odors; second, by certain psychic factors, as a fright or an emotional shock, a loud noise, a flash of light and many bizarre causes, especially in hysteric and neurasthenic subjects; third, by reflexes starting from variuos organs of the body, notably, the genital sphere, the gastro-intestinal tract (distension of the stomach, constipation, meteorism and intestinal parasites) and, above all, the nasal mucosa.

Causal treatment

Causal treatment should take all these elements into consideration. It is one of the fundamental rules in the treatment of bronchial asthma to carefully elicit from the patients statements in regard to those factors that seem to precipitate the attacks; and however ridiculous the determining elements may seem to be, to take the statements of the patient very seriously into consideration and to proceed accordingly. The element of suggestion is very strong in many cases, particularly in hysterical women who have preconceived notions in regard to the elements that produce asthma. To ridicule their belief is bad practice and in such cases, suggestion, even hypnotism, is useful; Christian Science has celebrated some of its greatest triumphs in the cure of such neurotic forms of bronchial asthma. In neurasthenic individuals judiciously applied hydrotherapeutic measures, as described in the Section on *Gastric Neuroses*, are exceedingly useful; if possible such patients should be treated for a time in an institution, where any ovarian or uterine trouble may coincidentally be corrected.

Suggestive treatment

Diet

The diet should always be carefully regulated. Overloading the stomach, particularly with starchy foods, should studiously be avoided. Constipation and flatulency should be combated with the means that are discussed under *Intestinal Diseases*. Intestinal parasites should be sought for, and if found, removed. The patients should be advised against going to bed during the period of active gastric digestion, in other words, they should never take a heavy meal at night, nor indulge in late suppers.

Constipation

Parasites

Nasal treatment

Treatment of the nose, while occasionally followed by very gratifying results in bronchial asthma, is, by no means, the panacea that it is claimed to be by extremists. It is good practice in every case of bronchial asthma to carefully examine the nose. The mucosa should be cocainized and sensitive areas, so-called 'asthma points,'' looked for by touching different intranasal areas with a probe. If marked respiratory reflexes can be elicited by touching such points, and especially if they are found upon a polypus or hypertrophied or turgescent tissues, then these over-growths should be removed. At all events the ''asthma points'' should be cauterized surgically. It is said that if true ''asthma points'' have been destroyed in this way, a febrile reaction will appear in the evening and persist for several days in susceptible individuals. If the patient will not give his consent to intranasal treatment between the attacks, then symptomatic relief can often be obtained during the paroxysm by touching the "asthma points" in the nose with a five to ten per cent. solution of cocaine hydrochlorate.

Climate

There is very little to say in regard to the selection of a climate for asthmatic subjects, for every patient is a rule unto himself. Some patients find relief at the sea shore, others at an altitude; some in a moist, others in a dry climate; a few people in the city and others in the country. It has been my experience that most of the cases do well after *any* change of climate, so that they should be instructed to go to one place first, and to seek some other locality, high or low, wet or dry, hot or cold, as soon as the asthmatic paroxysms again make their appearance. Sufferers from hay fever asthma, of course, should select one of the resorts mentioned in the Section on *Coryza Vasomotoria.*

Interim treatment

It is very important to attempt by all means at our disposal to reduce the number of attacks; for in this way the affected centres are given a rest and are enabled to regain their normal tone. In the interim between attacks certain remedies should, therefore, be administered that may accomplish this purpose. The principal reliance can, I believe, be placed upon the iodide of potash, given in ten to thirty drop doses of the saturated solution in milk, three times a day, for three or four weeks continuously, then omitted for a week and then again administered for a like period. Such an interrupted course of iodide of potash can be continued almost indefinitely, often with great relief to the patient.

Iodide of potash

Arsenic

Next in importance to iodide of potash is arsenic, given either in the form of Fowler's solution, beginning with five drops, three times a day, in water, and increasing the dose until fifteen drops, three times a day, are taken; or in the form of arsenious acid, sodium arseniate or sodium cacodylate (see page 74). Arsenic, too, should be given interruptedly, the patient taking the maximum dose for three or four weeks and then gradually reducing it, only to increase it again when the lowest dose is reached. Iodide of potash is the best remedy when there is much bronchitis, emphysema or arterio-sclerosis, or if there are manifestations of goutiness, whereas arsenic seems to yield better results in young, neurotic subjects without bronchitis or emphysema.

Atropine

Atropine is another useful remedy, provided the iodide of potash and the arsenic do not exercise the desired effect; it should be given in rather large doses, i. e., one-one-hundred-and-fiftieth to one-one-hundredth of a grain, two or three times a day for a considerable period of time, care being always taken that symptoms of atropine poisoning do not make their appearance. Atropine presumably acts by paralyzing the vagus terminations, thus reducing the spasm of the bronchial musculature and suppressing the bronchial secretion.

Treatment of the acute attack

Chloroform

Morphine

Cocaine

Chloral

Bromides

For the treatment of the acute attack a great many remedies have been recommended. It is necessary in bronchial asthma, owing to its manifold origin and the varying idiosyncrasies of many sufferers from this disease, to try a great many different remedies before finally one is discovered that seems to be specifically active in the particular individual. The most generally useful remedy to abort an attack is probably chloroform, which may either be administered in small whiffs or given internally as chloroform water in the dose of one to two teaspoonfuls, or as spirits of chloroform in twenty to sixty drops. If the paroxysm is not promptly checked by chloroform, then morphine should be given hypodermically in one-eighth grain doses, combined with a one-two-hundredth grain of atropine and two to five drops of a ten per cent. solution of cocaine hydrochlorate; this dose to be repeated two or three times if necessary. As it is not practical nor altogether safe to leave the hypodermic in the hands of the patient, this treatment should be reserved for use by the physician if he is called in early to a case of severe bronchial asthma. The patients may have on hand for internal use a solution of chloral hydrate, which is best given in combination with large doses of bromide of potash well diluted with some simple syrup and water. The following prescription I have found useful for stopping attacks of bronchial asthma:

℞

Chloral hydrate,	4 gm.
Potassium bromide,	12 cc.
Simple syrup,	32 cc.
Water,	96 cc.

M.

S. A dessertspoonful every hour until relieved, or until four are taken.

Chloralamid

Chloral hydrate should, of course, never be prescribed unless the heart is altogether intact. A useful substitute for chloral hydrate in such cases is chloralamid (see page 36), which may be given in doses of ten to thirty grains (0.65 to 2 gm.) two or three times in succession at intervals of one hour.

Asthma cigarettes

Very popular are asthma cigarettes made of the leaves of stramonium, belladonna, hyoscyamus or lobelia, usually mixed with potassium nitrate or smoked through paper that has been soaked in nitrate of potash. Trousseau recommends the following cigarette:

℞

Leaves of belladonna,	0.36
Leaves of hyoscyamus,	0.18
Leaves of stramonium,	0.80
Phellandrium aquat,	0.06

The ribs are removed and the leaves cleansed, a trace of extract of opium added and the mixture rolled up in paper treated with laurel water and dried. The mixture of these leaves may also be cut up fine and ignited on a plate and the fumes inhaled.

Cannabis indica

Cannabis indica is also used in the form of cigarettes and very good results are claimed from its use. The following mixture is particularly recommended by Ortner:

℞

Stramonium leaves,	
Potassium nitrate, of each,	2
Belladonna leaves,	
Herb. cannabis indica, of each,	10

The mixture may be used either in cigarettes or it may be mixed with nitre, ignited on a plate and the fumes inhaled.

Inhalations of potassium nitrate, ammonia vapors, tobacco smoke

In order to be effective the smoke from these cigarettes must always be inhaled. It is impossible to predict in advance whether or not they will help, but it is certainly worth while to try them in every case. Other remedies that are used for inhalation are nitrate of potash, which may, in a simple manner, be vaporized on a hot spoon. Ammonia vapors also occasionally relieve. Strong ammonia water is poured into a glass and the patient after plugging his nostrils with cotton inhales the whiffs of ammonia that are carried to his mouth by fanning across the top of the vessel. It is finally worthy of mention that some patients obtain marked relief from smoking tobacco.

Steam

It is always good practice during the attack to develop steam in the room. Sometimes relief is obtained if the patients repeatedly dip their hands or feet, or both, into hot water. Whether this is a reflex vaso-motor effect or pure suggestion is hard to determine; yet as the measure can do no harm, often does good, and is very simple, it should be advised.

CAPILLARY BRONCHITIS—BRONCHO-PNEUMONIA.

Catarrh of the smaller bronchioles (*bronchitis profunda, bronchiolitis capillaris*), especially in children and old people, frequently extends to the infundibula and ultimately involves the lobules of the lungs. From a clinical point of view, therefore, it is practical to consider capillary bronchitis and bronchopneumonia together.

Involvement of the right heart

Owing to the occlusion of numerous air channels and the narrowing of the bronchial lumen in either disease, the aëration of the lungs becomes deficient so that an excessive amount of labor is thrown both upon the right heart and upon the muscles of respiration. In most cases fever sets in that in its turn exercises a deleterious effect upon the heart muscle. Most cases, therefore, as will readily be understood, die not from the bronchial and pulmonary inflammation directly, but rather from embarrassment and failure of the right heart. One of the main objects of treatment, consequently, should be to support the heart, relieve the respiratory muscles of their excessive labor and reduce the temperature.

Hydrotherapy

Lukewarm baths

Here lukewarm baths (90° to 96° F.) gradually reduced to 75° or 60°, or followed by cold sponging, are the sovereign remedy. The explanation of their action is the following: By immersion in water that is somewhat below the normal body temperature a preliminary contraction of the cutaneous vessels is produced, especially in febrile cases; this is followed by a reactive dilatation of these vessels which can be markedly enforced by rubbing the patient while he is in the bath. The primary shock and the sudden contraction of the skin vessels causes reflex stimulation of the heart and of the respiratory centres as manifested by a rise of the blood pressure and a few deep inspirations. The passive hyperemia of the skin which follows, in its turn depletes the bronchial mucosa, relieves the heart, reduces the blood pressure and quiets respiration. The effects of the primary shock are very transitory, whereas the reaction persists for a long time. A second reaction can be secured if the patient upon leaving the bath is rapidly sponged with cold water of room temperature and is at once put to bed between warmed linen sheets and given the benefit of an energetic dry surface massage. The duration of the bath should not exceed ten to fifteen minutes and two or three such baths may be given during the day. This bath treatment is particularly useful in cases of capillary bronchitis affecting strong individuals without pulmonary involvement and without high fever. In all cases it is good practice to give a teaspoonful or two of brandy before the bath. If myocardial or arterio-sclerotic changes are present such cool baths should, of course, never be given.

Cold pack

Instead of cool baths the cold pack may be applied as follows: A linen sheet is wrung out of water of from 50° to 65° F. and the patient quickly wrapped up in the sheet and covered with a woolen blanket. Here, too, there is a preliminary shock, promptly followed by the desired reaction. It is best to cover only portions of the patient's body at a time, applying the sheet once to the thorax, then to the abdomen and then to the legs. In very nervous subjects and in cases suffering from much dyspnea, I have made it a rule always to leave the arms free when administering a wet pack, for wrapping the sheet around the arms causes a sense of restraint and oppression that excites and worries the patients and reacts unfavorably upon the heart's action and the blood pressure—conditions which should be avoided. The cold packs should be repeated at short intervals until the temperature is lowered several degrees. As a rule, after the first pack the temperature at first falls quickly, but rises again as quickly, i. e., within a few minutes, so that it usually requires three or four applications of the wet sheet to keep the temperature permanently down.

Hot bath

In some forms of capillary bronchitis there is no fever, the patients even develop sub-normal temperatures with cyanosis and cold hands and feet; here cold hydrotherapeutic measures are altogether out of place and the hot pack or the hot bath should be given instead. Contra-indications to the use of hot hydrotherapeutic measures are myocardial changes and arteriosclerosis. In giving the hot pack the sheet is wrung out of water of 100° to 105° F. and the patient speedily wrapped into it and covered as above; or the patient may be placed into a bath of 100° F. for ten or fifteen minutes. In either case an ice bag or cold cloths should be applied to the head. As soon as the hot cloth is removed or the patient leaves the hot water, the skin should be energetically rubbed with a warm rough towel and the patient placed to bed and covered with linen or cotton bed-clothing.

Hot pack

The good effects of the hot bath must be attributed to the passive hyperemia of the skin that sets in promptly, for the dilatation of the superficial capillaries that is produced is practically synonymous with bleeding the patient into his own vessels; the fall in the blood pressure that results herefrom greatly relieves the heart without depressing it. Here, too, as in the case of cool bathing, the first contact with the hot water stimulates deep respirations and aids expectoration. The prolonged exposure to heat, besides, exercises a very desirable sedative influence on the nervous system, most patients promptly falling asleep after such bath. The temperature occasionally rises slightly while the patient is immersed in the hot water, but in febrile cases it generally drops 2 or 3 degrees as soon as the patient is back in bed.

Moistening the air

The air in the room should always be kept moist. This is best done by hanging sheets wrung out of hot water in the room, or by developing steam from a kettle or pan. In children the bronchitis tent described elsewhere (page 280) may be used and steam developed underneath it.

Rest in bed

Change of position

Cases that set in with high fever, and all cases of capillary bronchitis developing in children and old people, should be kept in bed, preferably in a semi-recumbent position; the patients should be ordered to frequently change their position so as to prevent hypostatic congestion of the lungs. Little children with capillary bronchitis should be frequently lifted out of bed and carried about.

Diet

The diet should be very strengthening but not bulky. No articles of food should be given that can dilate the stomach or produce gaseous distension of the stomach or bowels, as, otherwise, the heart's action may be mechanically interfered with and full excursions of the diaphragm downward prevented, so that coughing and expectoration would be rendered difficult. The diet should, therefore, be largely albuminous, consisting of scraped meats, broth, milk, eggs, with a little fresh fruit and fresh vegetables and a minimum of starchy foods and fats. Little food or drink should be taken at one time, the patient preferably eating small meals at frequent intervals. A little alcohol in the form of dilute claret, Rhine wine or whisky throughout the disease can do no harm; the alcohol acting beneficially both on account of its food value and on account of its general stimulating and supporting effect upon the heart. If symptoms of heart weakness appear, alcohol is by far the best stimulant in this disease.

Regulation of the bowel function

The bowels should be kept open throughout the course of the disease. Constipation and intestinal flatulence or meteorism are to be carefully avoided in order not to interfere with the movements of the diaphragm. In the beginning free catharsis should be promoted by a tablespoonful of castor oil, or by calomel best given in one-tenth grain doses repeated ten times and followed by a tablespoonful of magnesium sulphate in water. Later a mild saline laxative or wine of cascara may be given in doses sufficiently large to produce one or two free evacuations of the bowels every day.

Medicamentous treatment

Aconite

The medicamentous treatment of the bronchitis *per se* does not differ very materially from that advised in other forms of acute bronchitis (see page 281). If the disease sets in suddenly with high fever, drop doses of the tincture of aconite every two or three hours should be given. Narcotics should be used very

Narcotics

Stimulating expectorants

Emetic expectorants

sparingly, as it is self-evidently always dangerous to suppress the cough and stop the expectoration. If the cough is very distressing, if it is wearing the patient out, preventing sleep or straining the heart, as manifested by an irregular heart action after each coughing effort, then a five-grain dose of Dover's powder, or one-eighth grain of morphine with one-two-hundredth grain of atropine, or a one-fourth grain of codeine, may be administered several times a day. Stimulating expectorants as strychnine, senega or ammonium chloride, and small doses of the emetic expectorants, ipecac, tartar emetic, apomorphine, may be given with the reservations and precautions outlined in the Chapter on *Valvular Lesions* (see page 38) and the Section on *Acute Bronchitis* (page 282).

Heart tonics

Analeptics

Oxygen

As soon as alarming signs of heart weakness appear, heart tonics must be given (see page 32). I have made it a practice to give very small quantities of digitalis or strophanthus, i. e., two or three drops of the tincture several times a day from the very onset of the disease. In this way the heart's action is rendered more regular, while, at the some time, no over-stimulation is produced. I have never seen any ill-effects from this practice. If small doses are given larger doses always remain available for emergencies. If signs of heart failure appear suddenly (and if the case is carefully watched from the beginning and treated with small doses of heart tonics this failure is not apt to appear unexpectedly), camphor, ether, ammonia must be given hypodermically (see page 32) and the patient sponged or douched with very cold and very hot water alternately. On rare occasions it may become necessary to resort to inhalations of oxygen, combined with the use of strychnia in one-twentieth to one-fortieth grain doses, given hypodermically in order to overcome cyanosis, excessive dyspnea and lividity.

The treatment of the convalescent stage is the same as in any other form of bronchitis.

II. DISEASES OF THE LUNGS.

PULMONARY EMPHYSEMA.

Limitations of treatment

On account of the mechanical and destructive character of the lesion in pulmonary emphysema a cure of this disorder is manifestly out of the question. We are dealing with a rarefaction of the intralobular septa either throughout the lung or in certain circumscribed regions (as in compensatory or traumatic emphysema) with atrophy of the alveolar walls, obliteration of capillaries and loss of elastic tissue and, in many cases, anatomic rigidity of the chest wall with ossification of costal cartilages.

Hereditary element

When one considers further that in many cases of emphysema, especially when occurring in young people (with or without the co-operation of factors like over-exertion and violent respiratory efforts incident to various occupations), a distinctly hereditary element, manifesting itself by abnormally high intra-pulmonic blood pressure and congenital weakness of the alveolar walls must be included in the question, then it becomes clear that even prophylactic treatment directed towards checking the progress of emphysematous changes when they first make their appearance is generally a futile task.

Treatment largely symptomatic

For all these reasons the treatment of emphysema is of necessity largely symptomatic. Our efforts must be directed chiefly towards counteracting the bronchitis that complicates and aggravates most cases of the disease; then towards preventing or correcting the dilatation and hypertrophy, especially of the right heart, that generally precede or follow emphysema; and towards relieving the signs of venous stasis about various organs that develop consecutively to the cardiac insufficiency. Finally the asthmatic seizures and the attacks of dyspnea that render the existence of advanced cases of emphysema so hard to bear must be energetically treated and if possible relieved.

The complicating bronchial catarrh

In undertaking to treat the bronchial catarrh in any case of emphysema of the lungs it is very important, as a preliminary step, to determine whether the bronchial catarrh preceded the emphysema or whether it developed consecutively to emphysematous rigidity of the lung. This point can usually be determined with some degree of accuracy from the history.

Expectorants

If the bronchitis preceded the emphysema then it is presumably of the simple catarrhal variety, and here the various cough remedies, sedatives, expectorants, etc., that have been described in full in the Section on *Chronic Bronchitis* (page 284) have their field of usefulness.

Cardiac tonics

If the bronchitis developed after the emphysema, then it is generally due to venous hyperemia of the bronchial mucosa produced by the impeded pulmonary circulation and the weak action of the right heart that so commonly supervenes in pulmonary emphysema. If a careful examination of the heart reveals dilatation of the right half and marked accentuation of the second pulmonary sound and if, at the same time, evidence of venous stasis, due to cardiac insufficiency, is discovered in other regions of the body, then venous stasis can be charged with producing the bronchial catarrh, and the treatment should be largely cardio-tonic, as described in the section on *Valvular Diseases* in the stage of failing compensation.

Unfortunately the exact determination of the heart bounda-

Significance of bloody sputum

ries is frequently a very difficult matter in emphysema because the superficial heart dullness is commonly obliterated in emphysema of the anterior margins of the lungs, and because deep percussion does not yield very positive information in advanced degrees of emphysema. The presence of a little blood in the sputum may aid in the differential diagnosis between hyperemic catarrh of the bronchi, due to venous stasis, and simple bronchitis, slight degrees of hemoptysis speaking for hyperemia of the bronchi.

A therapeutic test, finally, with heart tonics may aid in the decision; for venous stasis in the bronchi, i. e., hyperemic catarrh, yields readily to the judicious use of these tonics, whereas catarrhal bronchitis is in no way influenced by cardiotonic medication.

Catarrhal asthma

There is still another variety of bronchial catarrh in emphysema that assumes the characteristics of catarrhal asthma. The dyspnea is paroxysmal and spasmodic and the sputum in many cases contains eosinophile cells. Here, too, the catarrhal asthma may have preceded the emphysema or it may have followed it, the former being the more common event. The treatment of this variety of bronchial catarrh must be carried out as described in full in the Section on *Bronchial Asthma.*

It will usually be found that if the bronchitis, *scil.,* the cough, expectoration and the asthmatic paroxysms, are held in check the patients notwithstanding their emphysema will feel relatively comfortable, in fact, rarely suffer from their emphysema *per se* unless the latter is so far advanced as to materially reduce the breathing surface of the lung and to cause marked insufficiency of the right heart with all that that entails. Hence it is a matter of greatest importance to determine the exact cause of the bronchial trouble and to attack it energetically.

Dyspnea

The dyspnea that emphysematous patients suffer from calls for the same careful analysis as the bronchial catarrh. It may be due either to the emphysema itself, i. e., it may result from the reduction of the breathing surface of the lung, or it may be paroxysmal in character, i. e., an asthmatic dyspnea, or it may be due to cardiac insufficiency. In the latter case appropriate cardio-tonic treatment is usually effective; in asthmatic dyspnea the treatment is the same as given in the Section on *Bronchial Asthma.*

Climate and resorts

In view of the chronic character of emphysema the choice of a resort or a climate and of the proper altitude is exceedingly important. Here, as in the selection of all the other remedial measures that are to be employed, the exact causes that determine the complications, chiefly the bronchitis and the dyspnea, must be considered and advice rendered accordingly.

Altitude

Thus in the selection of an altitude everything will depend upon the condition of the heart, the severity of the bronchial catarrh and the degree of emphysematous dilatation of the lung.

Moderate altitudes

If the emphysema predominates and the bronchial catarrh is relatively slight and the cardiac insufficiency not far advanced, then a moderately high altitude should be selected, for these patients complain chiefly of difficulty in getting rid of the air, that is, of *expiratory* dyspnea; so that the low barometric pressure at an altitude and the rarefied air render expiration easier and hence help the patient. Incidentally slight degrees of bronchial catarrh are not unfavorably influenced by an altitude.

Southern low climates

If, on the other hand, the catarrhal condition of the bronchi predominates so that there is abundant irritating secretion and much cough with resulting strain upon the heart, then these patients should be advised against seeking high altitudes and should live in a Southern climate at a low barometric pressure with the minimum of temperature changes, a maximum of clear, sunshiny days and little humidity in the air. The latter requirements can frequently only be met in semi-tropical arid regions; here however the dust and alkali in the air usually constitute a serious irritant to the bronchial mucosa and produce violent coughing efforts—therefore the climatic advantages are often neutralized in this way, so that emphysematous patients should be sent by preference to moist, warm, rather than to dry, warm climates. For such cases the seashore in Southern regions, or an ocean voyage through Southern seas, is of signal benefit.

Sea shore and sea voyages

Pneumatic chamber

Patients who cannot seek a proper climate occasionally derive benefit from the use of pneumatic chambers at home and in resorts located not too far from home. A great many different kinds of apparatus have been constructed by means of which the patient breathes under pressure; all of them improving the bronchial catarrh of emphysema provided it is due to hyperemia of the bronchial mucosa. Symptomatically, too, breathing compressed air helps many cases of emphysema; the exact scientific explanation of this clinical fact is still forthcoming.

Laxative waters

In choosing a resort for an emphysematous case the character of the waters may be advantageously considered in addition to the altitude and climate and the facilities for breathing compressed air. Resorts furnishing laxative water should be given

Diet

the preference for by the judicious use of saline laxatives abdominal plethora is corrected and hence the right heart relieved of much labor and breathing thus facilitated. On the same principle catharsis by saline laxatives should be promoted at home.

Little albumen

The diet should be selected with the object in view chiefly of preventing abdominal plethora and over-loading or distension of the stomach. Consequently the diet should not contain too much albuminous pabulum, for the latter produces engorgement of the mesenteric veins during digestion, i. e., abdominal plethora, more than other food. The use of aërated beverages and of fermenting foods chiefly of the starchy variety, should be interdicted. If necessary anti-fermentative remedies (see *Meteorism*), may be given from time to time to prevent flatulency and distention of the stomach and bowel. In cases with a tendency to dyspnea large meals should never be allowed; the patient should be instructed to eat small meals at frequent intervals. All these dietetic rules are intended to prevent pressure upon the diaphragm from below by a distended stomach or bloated bowel and hence interference with free respiratory excursions.

No large meal

Reduction of obesity

If the patient with emphysema is obese, then a reduction cure is an exceedingly useful element in the treatment; for the presence of large quantities of intra-abdominal fat interferes with the respiratory movements of the diaphragm downward and hence increases the dyspnea, an effect that is enforced by the weight of large fat masses upon the thorax. Obese patients, moreover, as a rule suffer from abdominal plethora, constipation, flatulency, all factors that should be counteracted in emphysematous dyspnea. Finally, the heart, as is well known, is particularly over-strained in advanced degrees of obesity. This is due in part to the presence of fat masses around the organ and infiltration of the heart muscle by fat, or to fatty degeneration of the heart muscle; in part to the great resistance offered to the flow of blood by the fine network of capillaries that forms in new adipose tissue; and to many other causes that have been discussed in full in the Section on *Obesity* on page 148. Some of the most gratifying results are obtained precisely in obese emphysema cases suffering from much dypsnea, bronchitis and symptoms of stasis in various organs as soon as the bulk of the patient is reduced by a carefully carried out cure. For the choice of method and the technique of the latter I refer to the Section on *Obesity*.

Venesection

Occasionally a patient with advanced emphysema suddenly develops quite alarming degrees of dyspnea and cyanosis that endanger his life. In such cases without regard to what the exact pathogenesis of these phenomena may be in the individual case (and time will rarely be given to make a careful analysis of all the contributing factors) bleeding is the sovereign remedy. From two to three hundred cc. of blood should be removed at once from the median basilic vein, as described on page 37. At the same time inhalations of oxygen may be given; two or three gallons of oxygen being administered every two or three hours. If the excitement is great and the patient very restless, then an hypodermic injection of an eighth of a grain of morphine with a two-hundredth of atropine frequently furnishes prompt relief. While these measures are being carried out the heart should be supported by the hypodermic administration of analeptics, camphor, ether, ammonia, strychnia, given as described in detail in the Section on *Valvular Diseases of the Heart* in the stage of failing compensation (see page 32).

Oxygen inhalations

Morphine

Analeptics

PULMONARY EDEMA.

Collateral pulmonary edema

There is an inflammatory pulmonary edema due to local processes and occurring in the neighborhood of acutely inflamed areas, infarcts, tumors, etc., of the lungs, mediastinum and pleural cavities. This so-called collateral pulmonary edema is due either to local injury produced in the vessel walls of a given vicinity by bacterial toxins, or it may be due to plugging of blood-channels and lymph spaces, or to mechanical compression of the latter in circumscribed areas of the lung. This local pressure or plugging, with or without degeneration of the vessel walls by toxins permits diapedesis of serum and probably also of corpuscles into the air cells and the alveolar tissues of certain circumscribed regions of the lung and, in this way, produces localized pulmonary edema.

This variety is rarely amenable to treatment other than that directed towards the underlying cause. In fact, the edematous area is often so small as to cause little discomfort and produce few symptoms. If large areas of the lungs become edematous from this source, then the symptomatic treatment is the same as that of any other form of acute pulmonary edema.

Angio-neurotic edema

Toxic edema

Edema due to paralysis of the musculature of the pulmonary arteries may be a part phenomenon of hysteria (angio-neurotic edema) or it may occur in the course of chronic intoxications as, e. g., in uremia, acute alcohol poisoning, lead-poisoning, iodide-poisoning, etc.

The most common form of pulmonary edema, however, is

Edema due to stasis

that produced by stasis in the pulmonary veins. This is an edema of the lungs that accompanies general disorders involving the competency of the heart, hence it often constitutes a terminal phenomenon in a variety of infectious and chronic cachectic disorders; it also occurs in valvular diseases of the heart and in cardiac disorders of manifold origin, fatty heart and myocarditis.

Pulmonary edema usually due to several factors

In most cases of pulmonary edema several of the above factors are operative; thus, for instance, in uremic edema occurring in cardio-renal disease there is at the same time chronic intoxication from renal insufficiency, and a weakened heart and weakened blood vessels. In pulmonary edema occurring in infectious diseases, as typhoid, measles, influenza, pneumonia, etc., there is a general bacterial toxemia and often, at the same time, myocardial degeneration as a result of the infection. In pulmonary edema occurring in the course of anemia and cachectic states there is usually injury to the structure of the blood vessel walls from malnutrition and, at the same time, a heart with a weakened myocardium and self-evidently with a tendency to dilatation and insufficiency.

Condition of the heart important

It will be seen, therefore, that in almost all cases of chronic pulmonary edema the condition of the heart must, above all things, be seriously taken into consideration, hence the treatment differs somewhat according to the condition of the heart.

One can for therapeutic purposes distinguish between cases of chronic pulmonary edema in which the heart's action is good and the myocardium apparently intact, and cases in which the heart's is weak and in which evidences of myocarditis, dilatation, fatty degeneration, etc., are apparent.

Cardiac tonics

The latter variety of cases is by far the most common of the two. Here the judicious use of cardiac tonics and of all the other hygienic, dietetic and hydrotherapeutic measures that have been described in full in the Section on *Valvular Diseases of the Heart* in the state of broken compensation must be employed. Here, too, active catharsis and the stimulation of diuresis and diaphoresis, with all the precautions and reservations that have been discussed at length in the above section, have a useful field of application. Dry cupping over the chest (see page 39) is a useful adjuvant to the treatment, especially in those peculiar cases of cardio-renal edema of the lung in which the edematous effusion seems to occupy circumscribed regions of the lung only.

Catharsis
Diuresis
Diaphoresis

Cupping

Avoidance of iodids and bromids

In all cases of chronic pulmonary edema particular care should also be exercised to avoid the administration of certain drugs that can produce hyperemia and congestion of the bronchi, notably iodids and bromids. This warning is appropriate because in many cases of chronic pulmonary edema insomnia, due to the difficulty of breathing and possibly to circulatory disturbances of the brain that result from the cardiac insufficiency, is a very distressing symptom. Here the temptation is always given to administer bromids. On the other hand many cases of cardiorenal disease develop on the basis of a syphilis, so that a course of antiluetic medication with large doses of iodids might seem indicated.

Acute edema

Acute edema of the lungs developing as an exacerbation of chronic edema or occurring suddenly and independently, immaterial what its origin, calls for rapid interference, for this disorder always constitutes an emergency that threatens the life of the patient.

Atropine
Hyoscine
Scopolamine

The best remedy in any case is atropine or its congeners, hyoscine (scopolamine). These remedies should be given hypodermically in large doses, that is, in doses of one-sixtieth to one- thirtieth of a grain (1 to 2 mg.) repeated two or three times, or oftener at intervals of one hour. To give smaller doses is, in my experience, a waste of time. The after-effects of the large doses of atropine or hyoscine are disagreeable, but one is dealing with a life and death question in which unpleasant sensations affecting the patient should not be considered. The action of atropine and hyoscine is to stimulate both the respiratory centers and, at the same time, the vaso-constrictors; in this way, in all probability, counteracting the mechanical dilatation of the vessel walls and rendering them less permeable to blood serum. In acute edema occurring in the course of chronic cachectic diseases and in disorders accompanied by malnutrition and degeneration of blood vessel walls no ready response to vaso-constrictor influences will be obtained; but cases advanced to this point are almost invariably fatal and as no harm can be done by giving atropine in large doses a trial, one need not hesitate to begin the emergency treatment, even in such cases, with large doses of atropine or hyoscine.

Ergot

Second in importance to atropine is ergot. This drug also is given on account of its power to cause constriction of blood vessels in certain areas of the body. Ergot does not produce general vaso-constriction, otherwise it would raise the general blood pressure much more than it does. It causes constriction merely of the blood vessels in certain areas of the body; we know positively that it exercises this effect about the female adnexa, whether it exercises the same effect upon the pulmonary blood vessels we do not know positively, but some experimental evidence seems to indicate that it does. Empirically and clinically

Action of ergot

we know, at all events, that it raises the blood pressure in the pulmonary circulation and hence we are justified in concluding that it also exercises a local vaso-constrictor effect; for this reason the remedy is useful in pulmonary edema, and for the same reason it is so dangerous in hemoptysis (see page 310); for if there is rupture or erosion of blood vessels within the pulmonary area the beneficial effects that might accrue from the vaso-constriction are more than neutralized by the rise in blood pressure that is at the same time produced.

Mode of administration

If given in pulmonary edema it should be given either in the form of the Injectia Ergota Hypodermica in the dose of three to twenty drops, or by mouth as the solid extract of ergot in doses of three to sixteen grains (0.2 to 1 gm.). It can, to advantage, be combined with atropine and the following combination I have found useful and safe:

℞

Atropine,	1-50 gr. (0.0013 gm.)
Extract of ergot,	10 gr. (0.6 gm.)

M. Sig. One capsule every hour until relieved
or until four are taken.

Cacodylate of soda

Still another remedy that may be used as an emergency measure in pulmonary edema is cacodylate of soda. This preparation of arsenic should be given in large doses in order to be effective. It exercises a most remarkable influence upon exudates and edematous effusions without, to my knowledge, possessing any disagreeable after-effects. It is perfectly safe to give sodium cacodylate hypodermically in one grain doses, in watery solution, every three or four hours, for four or five doses. A convenient way to administer the remedy is to have a solution of fifteen grains of cacodylate of soda to the ounce of water made and to inject a Pravaz needle full subcutaneously or intramuscularly every three or four hours. When one considers that one grain of cacodylate of soda contains as much arsenic approximately as three-fifths of a grain of arsenious acid, the absence of symptoms of arsenic poisoning after the administration of this drug is very remarkable.

Analeptics

If there is much cyanosis in acute edema with other evidence of embarrassment of the right heart, then active cardiotonic medication becomes necessary. Here the character of the pulse, the size of the heart, the strength of the apex beat and its reaction must all determine the dosage of the various analeptics and cardio-tonics that are to be administered. The same principles should govern us here as in the treatment of cardiac stasis due to decompensated valvular lesions. Ether, ammonia, camphor, camphor in ether, camphor in oil, champagne and, in less acute cases, digitalis, strophanthus, caffein, all have their application (see page 32).

Venesection

Venesection may be practised in extreme cases and very marked relief is frequently obtained from the withdrawal of two or three hundred cc. of blood. It is always safe and good treatment, if none of the above emergency medicines are immediately available, or if they do not act very promptly, to bleed the patient as a preliminary measure. In the same sense the application of leeches to the anus, i. e., bleeding from the hemorrhoidal veins occasionally helps (see page 40).

Leeches to anus

Paracentesis of the abdomen in portal stasis with pulmonary edema

In advanced cases of cardiac incompetency with venous stasis in the portal area and abdominal ascites, paracentesis of the abdomen and withdrawal of some of the ascitic fluid frequently exercises a very beneficial effect upon the pulmonary edema. This effect must be attributed to the relief of pressure produced within the abdomen which enables the veins of the portal area to expand more readily and consequently to harbor more blood within their lumen. Abdominal puncture in these cases is, therefore, in a sense, bleeding the patient into his own blood vessels.

PULMONARY INFARCT, ABSCESS AND GANGRENE.

In view of the mechanical character of the lesion in pulmonary infarct the treatment is largely symptomatic.

Prophylaxis

Prophylaxis is in a sense possible; for given on the one hand a phlebitic process about one of the extremities, the brain sinus, uterus, the hemorrhoidal veins, about recent fractures, or on the other hand, a weak right heart with endocardial disease, or both, and the possibility of embolus formation and pulmonary infarction must always be remembered. Hence the existence of any of the above named conditions should put us on the alert for pulmonary infarct and the attempt should be made to prevent its development.

Principles of prophylaxis

The principles that should govern this prophylactic treatment are the following: We know from experience that there is less probability of embolus formation in the marantic variety of phlebitic thrombi that develop as a late phenomenon in chronic cachectic disease, cancer, severe anemias, phthisis, etc., than in thrombosis due to acute phlebitic processes. This is owing to the fact that marantic thrombi develop slowly and are consequently better organized, i. e., more solid and more adherent to the vessel walls than thrombi that develop rapidly as the result of acute phlebitis; and also to the fact that sufferers from marantic thrombosis are usually very weak and of their own inclination remain quiet, while patients with acute phlebitis are strong, apt to be restless and to move about a good deal, hence favoring the breaking off of emboli from the thrombus.

Rest and immobolization in acute phlebitis

In acute phlebitic disease consequently every effort should be made to favor slow development of the thrombus and to keep the patient quiet, in this way rendering the breaking off of fragments of the thrombus and hence embolization and infarction in remote regions of the body less probable.

Danger of massage and inunctions in phlebitis

Every patient with phlebitis should therefore be put at rest in a recumbent posture and should be warned against performing any sudden movement. If the phlebitic process is going on in some extremity of the body then the latter should be immobilized with loose bandages or splints and kept perfectly quiet in a horizontal position. Massage of the affected limb should not be given nor inunctions, that are so popular in phlebitis, be administered. Rest of the body and of the affected extremity should be maintained until all the sequelæ of blood vessel occlusion have disappeared, that is, until the extremity has regained its natural red color and temperature and size. As long as the limb is swollen, pale, cool and edematous there is danger of embolization. In phlebitic processes, involving the pelvic or the hemorrhoidal vessels, straining at stool, violent coughing efforts and hiccough should be avoided as much as possible.

If in spite of these precautions, that cannot unfortunately be carried out successfully in every case, the patient suddenly experiences a pain in the chest, begins to cough violently, becomes dyspneic, possibly spits some blood and faints, then infarction of the pulmonary vessel with extravasation of blood into the pulmonary air cells and the interstitial tissues of some region of the lung may be suspected.

Treatment of sudden infarction

Artificial respiration

Oxygen

Hot compresses
Analeptics

The treatment of this syndrome is the following: If the patient is in syncope, as a result of the infarction, he should be placed in a horizontal position. If there is much dyspnea artificial respiration should be practised and oxygen inhalations given. At the same time hot compresses should be applied over the chest. If the heart is weak, the pulse feeble and rapid, then analeptics should at once be administered beginning with a hypodermic of thirty minims of ether and following with an injection of camphor in ether or camphor in oil, as described on page 32.

Morphine

As soon as the patient revives from his faint an injection of a quarter-grain of morphine with two-hundredth of a grain of atropine is given in order to allay restlessness and excitement.

If, shortly after the infarction, evidence of pulmonary edema begins to appear, then two or three hundred cubic centimeters of blood should be withdrawn by venesection from the median cephalic vein as described on page 37. If the hemoptysis is very abundant then this complication should be treated as described in the Section on *Hemoptysis*. The bleeding from the lung is rarely very profuse or persistent in pulmonary infarct and it is well to remember that infarction of the lungs may occur without any hemoptysis.

Venesection

If the infarction in any particular case is attributable more to thrombosis of branches of the pulmonary artery from the right auricle than from embolization originating in some phlebitic process in a remote portion of the body, and if there is tangible evidence of cardiac dilatation and insufficiency, then cardiac tonics, digitalis at their head (see index) should be administered, an ice bag should be applied to the precordium and venesection performed. If, however, the hemorrhage from the lungs is very severe, then venesection is contra-indicated.

Cardiac tonics

Ice bag

PULMONARY ABSCESS AND GANGRENE.

In connection with the treatment of pulmonary infarct a few words may be said in regard to the treatment of pulmonary abscess, for this lesion not infrequently develops as the result of pulmonary infarct due to occlusion of a pulmonary vessel by a *septic* embolus. The symptomatic treatment of pulmonary abscess dependent upon this cause in the beginning corresponds to that of any other form of pulmonary infarct.

Pulmonary abscess

In fully developed pulmonary abscess due to septic infarct from septic phlebitis or endocarditis, or to any other cause as the aspiration of a septic foreign body, purulent breaking down of a pneumonic or tuberculous focus, etc., or in abscess occurring as a part phenomenon of a general pyemia, internal treatment is practically of no avail and the case becomes a surgical one, i. e., the indications are created for opening the abscess by pneumotomy and establishing drainage. If there is only a single abscess cavity, and if it can be definitely located, the injection of antiseptic fluids, as carbolic acid, iodoform emulsion, menthol, may be tried, but this treatment is very uncertain, never without danger and essentially surgical in character, so that the injection treatment of pulmonary infarct need not be discussed in this volume. If the abscess cavity ruptures into a bronchus the treatment becomes synonymous with that described in the Section on *Bronchiectasis* (page [illegible]). If it ruptures into the pleural cavity an empyema is created which should be treated according to the rules laid down in the Section on *Pleurisy* (page [illegible]).

Pneumotomy and drainage

Injection of antiseptic fluids

Rupture of the abscess

Gangrene of the lungs, finally, may occasionally follow embolism of the pulmonary artery and infarction of certain areas of

Gangrene of the lung

the lungs. This development, however, is relatively rare and, as a rule, gangrene follows pneumonia, bronchiectasis or invasion of the lung by a foreign body either via a bronchus or the pleura. Here, too, internal treatment is unsatisfactory. Surgery has a definite field in the treatment of this disease, as in the treatment of abscess of the lung, and here, too, if it is possible to circumscribe the gangrenous area, the injection of a certain antiseptic solution (by a surgeon!) has a place.

Injection of antiseptic fluids

Fetor of the breath

The internist is often called upon to treat certain symptoms. The horrible fetor of the breath is an especially disagreeable accompaniment of this disorder. Inhalations of turpentine, lavender oil and tincture of eucalyptus are especially useful, employed either singly or combined. From five to ten drops of any of these preparations should be poured on hot water and the vapors inhaled through a paper cornucopia as described on page 284, or a few drops of the various oils may be inhaled through a steam atomizer. A two per cent. solution of carbolic acid inhaled in the same way is also frequently efficacious in correcting the bad breath.

Internal remedies
Turpentine
Myrtol
Eucalyptol

For internal use the rectified oils of turpentine, myrtol and eucalyptol are especially useful. If given in sufficiently large doses the expired air soon acquires an odor of turpentine, myrtol or eucalyptus, showing that a portion of these remedies is excreted through the lungs. Whether they act merely as deodorizers or also as disinfectants it is difficult to say. Their administration never does harm and often seems to aid materially in restoring healthier conditions. Rectified turpentine oil, myrtol and eucalyptol are best given in capsules in two minim doses every two or three hours until the breath smells of the drugs. It is well, in order to protect the stomach, to give some fat after these oils have been taken, or the patient should be ordered to drink a glass of milk with cream or to eat a piece of bread and butter after each capsule. A very simple plan, too, is to administer oil of turpentine directly on bread and butter.

That the general health and the nutrition of a patient suffering from circumscribed pulmonary gangrene should be raised to the highest possible standard by plenty of fresh air and a nutritious diet, suitable to the functional powers of the patient's digestive apparatus, is self-evident.

HEMOPTYSIS.

Definition

Hemoptysis properly speaking means hemorrhage from any portion of the respiratory tract, i. e., the pharynx, trachea, bronchi, or the lungs. The hemorrhage may either be due to rupture or erosion of one of the large blood vessels lining the respiratory tract, or to rupture of an artery adjacent to the air passages into the lumen of the latter, or it may be due to capillary oozing, that is, diapedesis of blood through the weakened walls of congested veins and capillaries in the respiratory mucosa.

Hemoptysis occasionally a protective process

Hemorrhage from the lungs may occasionally be a protective process and one that does not call for any interference. This applies particularly to three varieties of hemoptysis, viz., first, hemorrhage occurring before and during the period of menstruation; second, hemorrhage occurring in certain heart lesions, notably mitral and tricuspid insufficiency; third hemorrhage occurring in apparently healthy subjects, usually in adolescents.

Vicarious hemoptysis

The treatment of hemoptysis occurring before and during the menstrual period, i. e., vicarious menstruation through the respiratory passages, is the same as that described under vicarious epistaxis (page 272). An effort should be made to bring about bleeding from the uterus by hot vaginal douches, hot mustard foot baths, catharsis and the use of emmenagogue remedies, chief among them Pil. Aloes et Ferri, five grains (0.3 gm.) two or three times a day, or cimicifuga, which should be given in doses of five drops of the fresh tincture every four or five hours for two or three days preceding the expected menstruation.

Hemoptysis in valvular disease

Cardiac tonics

Hemoptysis due to pulmonary stasis from valvular disease may usually be considered in the light of a "safety-valve" action inaugurated by Nature to relieve engorgement of the right heart and embarrassment of the pulmonary circulation. It has its analogue in the hemorrhoidal bleeding so frequently seen in portal stasis due to obstructive processes (cirrhosis or stasis within the liver from heart disease). As a rule this form of hemoptysis calls for no intervention. In frequently occurring pulmonary or bronchial hemorrhages, however, due to heart disease with the loss of large quantities of blood, cardiac tonics, as described in the Section on *Decompensated Heart Lesions* are the chief remedies to be employed; and the results from this therapy are always satisfactory.

Prophylaxis Opiates

As a prophylactic measure against such hemorrhages it may become necessary to administer some opiate in order to reduce the straining effort incident to violent or persistent coughing. In other cases if the hemorrhage is so severe as to fill up large areas of the bronchial tree so that there is danger of suffocation, or if the patient after the hemorrhage experiences great difficulty in expelling the blood clots, so that there is danger of secondary infection (pus germs and other bacteria finding a suitable nidus for their development in the stagnating and disintegrating blood), then it may become necessary, as an extreme measure, to choose the smaller of two evils and to administer expectorants. The best remedy in these cases is ipecac root, given either in three or four large doses of fifteen grains (1 gm.), each, every hour, until vomiting occurs (Trousseau), or in small doses of one and one-half grains (0.1 gm.) every ten minutes to the point of nausea (Jaccoud). It will rarely become necessary, however, to adopt this somewhat precarious procedure and it must always be considered as a violent emergency measure adopted as a last resort to save a suffocating patient.

Expectorants Ipecac

Hemoptysis of adolescence

Closely related to hemoptysis from valvular disease belongs the hemoptysis occurring in healthy adolescents. The patients rarely feel any serious discomfort from the hemorrhages, which are generally slight. The explanation of these hemorrhages is difficult to give. It is probable that in rapidly-growing adolescents there develops a relative inadequacy of the heart's capacity due to the fact that the heart cannot keep up with the increasing labor that is imposed upon it when the body grows rapidly. As a result temporary insufficiency with dilatation of the ventricles, chiefly of the right heart, relative muscular insufficiency about the mitral and tricuspid valves occurs with venous engorgement in the pulmonary circulation and hemorrhage from the lungs. This theory is borne out by the frequent discovery in such cases of systolic murmurs at the apex and over the tricuspid area. The best treatment for this form of hemoptysis is rest and careful administration of heart stimulants and heart tonics (see page 38). The young people should be warned against excessive exercise and should be instructed to lead a quiet life, physically, mentally and emotionally. As a rule the heart soon adjusts itself to the increased demands upon its powers and the hemoptysis disappears never to return again.

Rest and avoidance of heart tonics

Hemoptysis from ulceration in the upper air passages

Hemorrhages from ulcers in the larynx and trachea are amenable to the same treatment as hemorrhages in any other exposed region of the body, provided the bleeding spot can be seen through the laryngoscope. Here the same rules apply as in the treatment of epistaxis due to similar causes. The hemorrhages can often be arrested by the application of a silver nitrate stick or of alum powder or, best of all, of the actual cautery, care being taken, if the latter is applied, to withdraw the point of the cautery while it is still hot, as otherwise the eschar may be torn off when the instrument is removed.

Topical treatment

Hemoptysis from aortic aneurism

Hemorrhages from aneurism of the aorta are in most cases very profuse and rapidly fatal so that no opportunity is given for any treatment. If the patient does not succumb at once to the loss of blood or to suffocation from flooding of the bronchial tree with blood, then the treatment becomes the same as that in any other form of pulmonary hemorrhage from an eroded blood vessel (see below).

Emergency treatment of hemoptysis

Position

Fainting

Morphine

Hemoptysis not due to vicarious hemorrhage nor to heart lesions and not occurring in an adolescent, under the conditions outlined above, but resulting from erosion of an artery (the protoype of such a hemorrhage being the hemoptysis of pulmonary tuberculosis) should be treated as follows: Upon the occurrence of the hemorrhage the patient should immediately be put to bed and kept in a sitting or semi-recumbent position, as it is easier to expectorate the blood when in this position than when lying down. If the loss of blood is so severe that the patient faints, then no effort should be made at first to revive him by the use of stimulants, as clotting is favored when the patient is unconscious. If the loss of blood is not so severe as to produce fainting, then above all things the patient's excitement should be allayed, if necessary by the hypodermic injection of a quarter of a grain of morphine with one-two-hundredth grain of atropine. In some cases it is best to refrain from the use of hypodermic medication, especially if the patient is afraid of the needle; in others it is well to insert a hypodermic needle if for no other reason than to give the patient the assurance that energetic measures are being instituted to save his life. The physician in such an emergency must be guided by the temperament of the individual patient.

Ice bag

If a physical examination, rapidly made, or if previous knowledge of the patient's lungs enables the physician to suspect from what part of the lungs the hemorrhage has occurred, and especially if there is pain in a circumscribed area of the chest, then an ice-bag should be applied over this point. If the bleeding spot cannot be definitely localized in a tuberculous case, then it is always safe to apply small ice-bags over the apical region. At all events an ice-bag should be placed over the heart in order to quiet its reaction and reduce its frequency. A very good plan is to apply the ice-bag intermittently over the suspected lung area and over the precordium, leaving it in place for an hour.

Aconite

Sodium nitrate

Rest in bed, morphine and the application of ice to the region of the heart are intended, above all things, to reduce the rapidity of the heart's action and to lower the blood pressure. The latter purpose can also be fulfilled by the use of aconite or of sodium nitrite, the former to be given in drop doses until the character of the pulse reveals that the blood pressure has been reduced; the latter in doses of one to two grains (0.05 to 0.1 gm.) repeated every three or four hours. Great care should be exercised not to produce too great depression and if the hemor-

timulants

rhage is severe and the pulse low and feeble when the patient is first seen, it is evident that remedies like aconite and sodium are contra-indicated. In the latter cases heart stimulants like strychnine, brandy, camphor, coffee, ether may be required to save the patient's life.

igation of
xtremities

Of other general measures that should be employed in pulmonary hemorrhage, ligation of the extremities with a bandage or a piece of rubber tubing is a useful procedure. The bandages or rubber ligatures should be applied so tightly that the venous back flow is impeded, while the progress of the blood into the limbs through the afferent arteries is not interfered with. The ligatures should remain in place from a quarter of an hour to one hour. This plan of treatment is intended to reduce the volume of blood flowing through the bleeding area and hence to favor coagulation.

piates

dministration

Of remedies that should be given in hemoptysis opiates occupy the first place. Opium or morphine may be given either by mouth or hypodermically (see above). If the insertion of the hypodermic needle does not excite the patient too much, the latter plan is by all means preferable. Occasionally the administration of opium or morphine by suppository or clysma becomes necessary (Dose and administration, see index). Opiates do not act as hemostatics but merely stop the cough and hence allay straining efforts; they also counteract restlessness and excitement and hence prevent high arterial tension from this source. Theoretically opiates are contra-indicated because they produce congestion in the peripheral vessels. Their exact mode of action upon the pulmonary vessels, however, is not altogether understood, and as we know empirically that they are highly efficacious in hemoptysis their use can be warmly recommended.

angers of
rgot

Of other hemostatic remedies ergot should, above all things, be eschewed for reasons that have been explained in full in the Sections on *Epistaxis* and *Pulmonary Infarct* (page 275). Hemorrhage, in the minds of many practitioners, spells ergot as the remedy and however correct ergot treatment may be in hemorrhage from the uterine cavity so incorrect it is in hemorrhages from most other portions of the body.

annic acid

amamelis

Tannic acid has been used extensively. It is questionable whether it is very trustworthy as a hemostatic in hemoptysis. The best form in which to administer tannic acid, and the one in which the drug does the least injury to the stomach, is as the fluid extract of hamamelis, which should be given in thirty minim (2 cc.) doses, in water, every two or three hours.

Lead acetate, which for a long time was very popular, is mentioned to be condemned. Lead acetate acts very well locally,

Lead acetate

but if given in doses large enough to reach the bleeding spot in a concentration that could promote arrest of hemorrhage, general lead-poisoning, nephritis or severe gastro-intestinal disturbances would assuredly develop. If given in smaller doses it would be ineffective as a hemostatic.

Turpentine

Oil of turpentine given in five drop doses in milk or on bread and butter, every two or three hours, is a valuable remedy especially in slow, persistent bleeding from smaller vessels, and I have seen several cases of hemoptysis yield to this treatment when all other remedies seemed to have failed.

Hydrastis

Hydrastinine

Cotarnine

The most reliable hemostatic we possess, however, is hydrastis canadensis. It may be given as the fluid extract in doses of fifteen to sixty minims (1 to 4 cc.), in milk, every hour for four or five doses; as hydrastinine hypodermically in doses of one-half to two grains (0.03 to 0.1 gm.); as cotarnine (stypticine) in doses of one-third to one-half grain (0.02 to 0.03 gm.), in watery solution, by mouth or hypodermically every hour for four or five doses or until the desired hemostatic effect is produced.

Gelatin

Gelatin has been used extensively in hemoptysis. In order to be efficacious it must be given in large doses. A very good method of administering it by mouth is to prepare a solution consisting of:

℞

Common salt,	1
Gelatin,	10
Water,	200

M. Sig. Of this mixture about one-third is given in one dose and two or three tablespoonfuls every hour thereafter.

Sometimes the administration of gelatin hypodermically aids in arresting hemoptysis, but this plan can usually only be carried out in an hospital where a carefully sterilized gelatin solution is ready for immediate use. It is always a dangerous procedure to administer gelatin hypodermically or intravenously in private practice, because gelatin is made from the hoofs of animals and, unless very carefully sterilized by discontinued sterilization on several successive days, may contain live spores of tetanus. Leaving this danger aside, the injection of gelatin at best is not an indifferent procedure, for the patients often react with slight fever and much local pain. For the technique of administering gelatin subcutaneously see also the Section on *Aneurism.*

After treatment

After the hemoptysis has been stopped the patient should remain in bed for some time. It is a good rule to keep the patient perfectly quiet until the last traces of blood have disappeared from the sputum. During this time he should be forbidden to speak loudly, to call or to otherwise strain the voice and indulge in violent respiratory efforts.

In order to prevent straining at stool it is always best to lock the bowels for several days by the administration of opiates. Later evacuation of the bowel contents should be made easy for several weeks after the hemorrhage by the administration of appropriate laxatives (see index) or the use of enemas.

Diet

In the beginning the patient should be kept on a liquid diet consisting, during the first days only, of small doses of ice-cold milk given frequently, later gruels, a little fresh fruit and vegetables, soft boiled eggs and, last of all, meat and meat products may be permitted. Tea, coffee, alcohol, very hot foods and carbonated beverages should be denied as long as there is any oozing of blood.

Causal treatment of slow hemoptysis

The causal treatment, finally, of slow hemoptysis occurring in the course of leukemia, the hemorrhagic diathesis and severe primary anemia is synonymous with the treatment of the underlying disorder. The symptomatic treatment of this form of hemorrhage does not differ from that of any other variety of hemoptysis of a slow character. Hemoptysis in pneumonia rarely calls for special treatment.

The treatment of the secondary anemia following severe hemorrhages or the continued loss of small quantities of blood through slow oozing from the respiratory tract has been fully described in the Section on *Secondary Anemia.*

PULMONARY TUBERCULOSIS.

Spontaneous recovery

Pulmonary tuberculosis in most cases shows a spontaneous tendency toward cure or latency provided the proper conditions are created for recovery. The main object of treatment, if the diagnosis is made early enough, is to secure for the patient ideal surroundings adapted to the individual peculiarities of the case, to grant the patient the maximum of pure air under suitable climatic conditions, and to feed, rest and clothe him properly.

Means of treatment

Medicines play a subordinate rôle in the treatment of pulmonary tuberculosis. There is no specific remedy for the disease (tuberculin, creosote, etc., see below) and drugs should be employed only to remedy especially distressing or dangerous symptoms and complications and, in the late stages, to render the patient comfortable.

Fresh air
Rest
Diet

Life in the open air when combined with proper feeding and careful regulation of rest and exercise, when carried out in surroundings and under conditions that favor a cheerful and hopeful mood and, above all, when carefully supervised and controlled by a competent physician, is the best remedy for the cure of pulmonary tuberculosis. It is important to realize, however, that neither fresh air alone, nor over-feeding alone, nor rest alone, can cure tuberculosis of the lung. It is essential that the three elements be combined. A phthisical patient may live out doors for twenty-four hours during each day and still not improve unless his diet is properly regulated, and unless he avoids exertion beyond his strength; or he may be over-fed and kept in bed and still succumb because the supply of fresh air is insufficient and the surroundings remain gloomy and depressing.

Rationale of fresh air treatment

Why abundant fresh air aids so materially in the cure of pulmonary tuberculosis is difficult to understand. Probably the absence of turbercle bacilli and of pus germs and other bacteria that produce mixed infection is an important factor. The open air, moreover, contains a much smaller proportion of the noxious gases, notably CO_2, of body emanations and chemical irritants that soon pollute the atmosphere of inclosed spaces. Finally, the ozone of out-of-doors, the radiation of the sunlight and, above all, the psychic stimulus of life near to Nature in open spaces, and the improvement of the appetite that results from an open-air existence must all be considered important elements.

Advantages of institution treatment

To secure an abundance of fresh air all the year round, in good weather and in bad, in the heat of summer and the cold of winter, is a difficult problem. The best conditions are undoubtedly obtained in a closed institution arranged especially for the care of tuberculous patients, and here assuredly the most brilliant results are obtained. Wherever feasible, therefore, the tuberculous patient should be advised to enter such an institution. The choice of the location, i. e., whether at an altitude or at the level of the sea, whether moist or dry, whether hot or cold, in other words whether mountain, desert or sea-shore, must be made according to the general principles to be presently discussed.

Home treatment

If the circumstances of the patient do not enable him to enter a private institution of this character, then he should be taught how to secure open-air treatment at home. Also in such cases the sacrifice, pecuniary and otherwise, incident to treatment in a closed institution, even if only for a short time, should wherever possible be urged. For the educational value of institution life is of inestimable value to such patients, especially in the present state of deplorable ignorance and scepticism on the part of the laity in regard to the curative value of such simple measures as air, food and rest. A patient who has spent even a few weeks in a well-conducted institution soon becomes an ardent and enthusiastic convert to the open-air idea, for he has been convinced by the good results he has seen, by the tales of convalescents he has heard, and he has had the benefit of the precepts and the suasion of the medical corps in charge. On returning from the institution the patient is generally only too glad to co-operate in every way with the family physician at home. Above all, he has learned to help himself in solving the difficult problem of securing the proper arrangements at home necessary to continue the plan of treatment begun in the sanitarium.

Technique of home treatment

Life in a tent placed in the back yard of a city home, or on a veranda with southern, southeastern or southwestern exposures, generally meets all the necessary requirements during the greater part of the year. During the rigid winter months tent life is usually unnecessarily uncomfortable and a room can be easily arranged in which the windows are kept wide open during the day and in which the patient properly clothed (see below) lives all the time. The room can be kept at a moderate temperature better than a tent. It is well to realize that air can be fresh and wholesome without being uncomfortable. During the night any one of the numerous window tents that are in the market, or that can be constructed by any carpenter, may be used to enable the patient to have at least his head out of doors while the body is warmly covered and comfortably tucked away in bed. Here the inventiveness and the ingenuity of the phycian, patient and friends must secure the proper conditions adaptable to the surroundings and circumstances peculiar to each individual case; and it would be a futile and superfluous task in this volume to discuss all the mechanical devices and to enumerate all the technical details that have been described to render the carrying out of the fresh air treatment of consumption practical.

Room temperature

Window tents

Errors of Routine

In recommending this mode of treatment for cases that are unable to avail themselves of the benefits of the sanitarium plan errors of routine are often committed. The physician who merely tells his patients to sleep out-doors or to keep the windows open all the year round, errs grievously if he contents himself with such general phrases; for it is very important to realize that many cases, especially in the beginning of the fresh air treatment, may become markedly aggravated unless the effect of the fresh air, especially during the cold and moist seasons of the year, is carefully controlled.

Disagreeable symptoms in beginning fresh air plan

One will quite commonly find that, in the beginning, the patients complain of irritation of the trachea and bronchi, of dizziness, insomnia and a general feeling of discomfort. In some, especially during foggy weather, the irritation about the respiratory organs often becomes altogether unbearable, so that increased coughing and severe dyspnea supervene. To insist upon wide open windows or an out-door life under these conditions is cruel and wrong. Such patients should, by all means, be very gradually accustomed both to the increased amount of out-door air and to the greater moisture and lower temperature of the atmosphere they are forced to breathe, and should not be allowed to ignore the disagreeable phenomena that make their appearance and to carry out the rigid fresh air plan despite of them. Again, most tuberculous cases are especially susceptible to drafts; this is due to the fact that tuberculosis is often accompanied by anemia and profuse sweating. Such patients are very apt to catch cold in the beginning of the fresh air treatment and, in this way, to have their condition seriously aggravated.

Hardening the patient as a preliminary

It often becomes necessary, therefore, as a preliminary to the continuous fresh air treatment, to subject the patient to a carefully regulated hardening process according to the principles that have been discussed in full in the Sections on *Anemia* and *Acute Rhinitis* (pages 79 and 266). For practical purposes the following method is very useful, not disagreeable, and, above all, never dangerous to the patients. The skin, in the beginning, is treated once or twice a day by dry rubbing under covers with a rough cloth or the hand. Later the surfaces of the body are treated with alcohol, then with alcohol and water and later with water that should be lukewarm at first and gradually used cooler and cooler until finally the patients can be sponged with water of room temperature. The sponging should be carried on under blankets, one extremity, the abdomen, back, chest, being treated at a time, and should be followed by a brisk alcohol rub. Still later the patient may be treated once a day by wet packs of room temperature, in such a way that the whole body is quickly wrapped in a linen cloth wrung out of cool water and covered with a woolen blanket. They are allowed to remain in this pack only from three to five minutes. The surface of the body is then rubbed dry with a rough towel and treated with alcohol.

In this way the superficial capillaries are educated to react more energetically to sudden temperature changes and the tendency to catching cold is materially reduced. At the same time the respiration, circulation and the general metabolism are greatly stimulated.

While this hardening process is being carried out, it will

Intermittent fresh air plan

usually be necessary to render the fresh air treatment intermittent, that is, to have the patients in the open only during certain hours of the day when the sun is shining and to have the windows open altogether only on days and nights during which the weather is not too cold or foggy, and only partially open on stormy days or nights with rain, snow, or violent winds. In such weather the patient should be carefully protected from the wind by a screen or some other protective device.

Clothing

The clothing of tuberculous patients undergoing the fresh air treatment should be regulated according to the temperature of the air. During warm weather flannel underwear that absorbs the moisture from the skin and allows its slow evaporation; during cold weather wool garments should be worn. Silk or linen underwear should never be allowed, for they cling to the skin and in this way obliterate the layer of immovable air that should intervene between the body surfaces and the first garment (see page 267). A sufficient number of woolen blankets should be used to keep the patient comfortably warm; on top of them furs may be placed, but furs should never be worn about the neck (see page 267). A cap made of wool may be used to protect the head and ears during the night, and hot water bags may be placed to the feet. It is a very important rule not to have the clothing about the chest too tight fitting in order that the respiration may not be impeded.

Choice of climate

Inasmuch as life in the open air is one of the most important factors in the cure of tuberculosis, the choice of a climate for tuberculous patients becomes a matter of serious import. The ideal climate by all means is the one in which the patient can enjoy the maximum of out-door life with the least discomfort.

When to send patients away from home

Above all, the physician who sends his tuberculous patients away from home in order to give them the benefits of another climate should consider the circumstances and the accustomed mode of life of the patient at home, and should compare them with the environment the patient will be forced to live in at the resort to which he is sent. If the case is very far advanced, or if the patient is in very moderate circumstances, it is usually a cruel undertaking to send him away from home and friends, away from the physician in whom he has confidence, into strange surroundings, among strange neighbors and to a strange physician. It is well to remember that climate alone can impossibly cure a case of tuberculosis unless the diet and the general mode of life are carefully regulated and unless the mood of the patient can remain at least as cheerful as it was at home. It is pitiable to see advanced cases of tuberculosis arriving at resorts for tuberculosis and eking out a miserable existence at a board-ing house where they are shunned like lepers (provided they are admitted at all); eating worse food than they received at home and living the lives of outcasts among unsympathetic strangers. Whoever has seen these poor sufferers sitting dejectedly on the curb in the broiling sun of a desert village, under-fed, over-exerted, helpless and thoroughly miserable, can hardly suppress a feeling of indignation at the almost criminal stupidity of those who are responsible for placing the unhappy exiles in such a position. It is a thousand times better that such cases should remain at home, even in a city and in a cold climate.

Provided, on the other hand, the patient's means permit him to secure the proper accommodations and diet and good medical supervision at the resort to which he is sent, then the climatic conditions that will most benefit the patient must be carefully considered. Two climates in particular enjoy deserved popularity in the treatment of tuberculosis, namely, mountain climate and Southern climates. Both have their advantages and their contra-indications. Some cases do best at moderate altitudes, others at the sea-shore or on an ocean steamer, some in the desert where the air is dry, others inland where the air is warm and moist. It would lead altogether too far to discuss in detail all the indications for the choice of climate as they arise in each individual case, especially as these indications vary with changes in the condition of the patient. The following general rules, however, may serve as a guide in the selection of a climate for tuberculous patients.*

Altitude
Mountain climate

Best of all for cases of tuberculosis is mountain climate. Here we have low air pressure, comparatively low temperature, slight fluctuations in the daily temperature, dry air, an atmosphere that is flooded with sunshine, that is pure and full of ozone and that contains no tubercle bacilli and few pus germs or other bacteria. The rarefied air exercises a beneficial influence upon respiration and circulation, by forcing the patient to breathe more deeply it alters the composition of the blood, stimulates metabolism, promotes the action of the skin, increases the appetite, and usually induces sound sleep, often, however, only after a period of several days or a week of insomnia.

Contra-indications to mountain climate

There are, however, distinct contra-indications to choice of a mountain climate in tuberculous patients. Cases in an advanced stage of anemia; cases suffering from continuous fever; cases with empyema, pleurisy or pneumothorax, or with laryngeal ulcerations; and patients with valvular heart lesions (see page 24) should be warned against life at an altitude.

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*See also Climate in *Valvular Diseases of the Heart.*

High altitude in winter and summer

Moderate altitude in spring and autumn

The best time to send tuberculous cases to an altitude is in winter. While it is very cold in the mountains the air is dry and there is rarely much wind, hence the cold is not so perceptible as in lower altitudes; the clear skies and abundant sunshine and the absence of much fog or mist, moreover, render a sojourn in mountain resorts more pleasant and more beneficial than in warmer regions in the valleys or the plains. In the heat of midsummer too high altitudes are not useful for obvious reasons. During the Spring and Autumn it is best to send patients to moderate altitudes rather than to high altitudes. This applies particularly to those who are sent to a resort for the first time in spring or autumn, for here sojourn at a moderate altitude, not to exceed 3,000 feet, for a time forms a beneficial transition to life at a higher altitude during the coming winter or summer months.

Life at a low altitude or at sea level may be considered indifferent as far as its effect upon the human organism is concerned. Here the temperature, the amount of sunshine and, above all, the amount of moisture in the air are the determining factors. Broadly speaking a dry climate at sea level has a mildly stimulating effect, whereas a moist climate at sea level has a mildly sedative effect (see page 24).

Low altitude
Dry, warm climate

Desert climate

A dry warm climate at a low level is especially useful in tuberculosis if there is an abundant secretion from the bronchi; such patients do especially well, as a rule, in a desert climate where there is also abundant sunshine and where the air is essentially free from pus germs. The latter element is very important, for most cases suffering from profuse expectoration are afflicted with a mixed infection. Life in the desert on account of the absence of pus germs in the air often aids materially in converting such a mixed infection into a simple tuberculous infection. This is an exceedingly desirable effect. High mountain climate shares this advantage with the desert and mid-ocean.

Low, moist climate

Seashore and island climate

To the category of low, moist climates belong chiefly sea-shore and island climates. Here the air is pure, contains a large proportion of oxygen, considerable moisture and salt, and a small amount of carbon dioxide. The moisture of the air and the salt it contains exercise a mildly stimulating effect upon the bronchial mucosa and the skin. The low pressure strengthens and retards the heart's action and induces deep, slow respirations. Appetite and sleep are usually improved in these climates. Very anemic patients, however, rarely do well at the sea-shore, for reasons that have been fully discussed in another section.

Rest

Rest is an element that is of the greatest importance in the treatment of tuberculosis. Consumptives, in the beginning, especially if they are suffering from a recent tuberculous infection with high fever, immaterial whether they live out of doors or in, should be kept absolutely at rest and quiet, i. e.: they should remain all day and all night in a recumbent or a semi-recumbent position. This also applies with particular emphasis to cases of tuberculosis that have had one or more attacks of hemoptysis or are very anemic.

Exercise

Walking

Hill climbing

As soon as some improvement has occurred and the temperature is low or normal (the sputum free from blood and the anemia improved) the patient should be allowed to walk on the level for a little time once or twice a day, beginning with short walks of not more than ten or fifteen minutes; they may then gradually be allowed to increase the amount of exercise according to the reaction they show. Shortness of breath, palpitation, dizziness, sweating are all danger signals indicating that the amount of exertion is too great. A tuberculous patient should never be allowed to exercise to this point. Later, as the improvement continues, very gradually controlled hill climbing may be permitted. In some resorts a regular Oertel-Terrain system (see page 23) is arranged and the amount of exercise carefully regulated by this means. While walking the patient should breathe deeply and with great regularity, an object that is best accomplished by instructing him to take a deep breath through the nose with each step.

Diet

Over nutrition

In selecting the diet for a tuberculous patient an attempt at over-nutrition should always be made. Mathematically expressed, a sufferer from tuberculosis should receive instead of the ordinary thirty to thirty-five calories per kilo each twenty-four hours (see page 114) at least forty-five calories. In well managed institutions the regulation of the diet is carried out according to calorimetric methods. In private practice and in most resorts feeding, owing to the difficulty of carefully performing metabolic studies, is generally carried out according to empiric rules, some of them very crude, very one-sided and very wrong.

The diet should be palatable

Forced feeding

The tastes and idiosyncrasies of the patient should always be very carefully considered and every endeavor should be advanced to render the diet palatable and agreeable. One of the most serious obstacles encountered in the forced feeding of tuberculous cases is the lack of appetite and the aversion to food (see below) that so many of these patients develop after a time. To avoid this is a fine art which should be cultivated. The diet should not be too one-sided nor monotonous, but should incorporate the greatest variety of food, prepared in a tempting form, preference, of course, being given to those articles of diet that possess the greatest nutritive (caloric) values.

Meat

Fat

The chief article of diet should, by all means, be meat, for it is a well known fact that carnivorous animals and peoples living on an abundant meat diet are much less susceptible to tuberculous infection than herbivorous animals and vegetarians. At the same time, abundant fat should be supplied in the form of cream, butter, bacon, olive oil in salad dressing or in mayonnaise, sardines, etc. In selecting meat those varieties containing abundant fat should be given the choice; and the meats should be prepared with plenty of fat.

Eggs

Eggs are a very valuable article of food and a convenient vehicle for supplying abundant nitrogen. They are best eaten either boiled or poached or in soups, sauces or omelets, or as an addition to milk as egg-nog. There is no particular advantage, a popular prejudice to the contrary notwithstanding, in using them raw. In some institutions enormous quantities of raw eggs are administered as a routine, with the result usually of thoroughly disgusting the patients so that they cannot take eggs at all after a time, and without doing them any particular good that could not be obtained by having them prepared in a more tempting form; for no article of food can be made more palatable, and prepared in more different ways, than eggs.

Milk

Milk is also a very useful article of diet and should be used liberally in the preparation of vegetables, sauces, gravies, etc. As a food between meals milk is also very useful, especially in the form of egg-nog or milk-cream mixture (two-thirds milk, one-third cream, one tablespoonful of lime water). Many people have a distinct aversion to milk and it is worse than useless to try to force them to drink it. Occasionally one can accustom patients to milk by serving it in small quantities and very cold, or with a little brandy. An attempt should always be made to do this. Some patients can drink milk without distaste but complain of a feeling of satiety even after taking small quantities, so they are utterably unable to swallow anything else with relish. In these cases, too, the administration of milk should be avoided or greatly curtailed, as otherwise over-nourishment of the patient becomes impossible.

Fruits and vegetables

Fruits and vegetables of any kind are allowed, preference being given to vegetables containing large quantities of albumen, as peas, rice, beans, etc. Plenty of milk, cream, butter, flour should be used in preparing all vegetable dishes.

Beverages

Alcohol

Of beverages, cocoa, chocolate, tea, coffee, bouillon, broths, meat extracts, buttermilk are all useful. Alcohol, too, is a food which should not be omitted from the bill of fare of tuberculous cases. It is best given in the form of dilute spirits or claret, or light wines diluted with water. Beer, owing to the percentage of carbohydrate it contains, is a particularly useful beverage and may be taken with impunity. It is especially useful in the evening on account of its slight soporific effect. Brandy or whisky as an addition to egg-nog is also useful. Strong alcoholic liquors, like straight whisky or brandy, should be avoided, especially in cases suffering from tachycardia or ulcerative processes in the larynx or digestive tract. That there are occasionally distinct contra-indications to the use of alcohol, especially in sufferers from cardio-renal disease and arterio-sclerosis, need hardly be emphasized.

Specific treatment

Medicamentous Treatment. The treatment of tuberculosis with products made from the tubercle bacillus, i. e., tuberculin and its various congeners, is still to be considered as in an experimental stage. Clinicians who have worked for years with these products report results that are greatly at variance, some claiming good effects in all cases, others indifferent effects in most cases. In resorts in which the use of tuberculin and similar products is combined with rest, proper feeding and an out-door life the results seem to be fairly good, but here it is very difficult to determine how much of the benefit is to be attributed to the rest, the diet and the fresh air, and how much to the "specific" remedy.

Tuberculin

From what experience I have had with this remedy in hospital practice and from what I can glean from the literature, I am inclined to think that tuberculin possesses some curative value if properly used; but that this substance is also very dangerous unless administered in very small doses and under very careful control.* Tuberculin should be used in small doses, so small that no reactive symptoms (i. e., fever, signs of local irritation in the affected area, general lassitude, headache, pain in the joints, etc.) appear. The dose may be gradually increased until these symptoms appear and then it should be immediately reduced and the patient kept on a quantity slightly below that at which a reaction occurred. It is manifestly a difficult matter to determine the onset of a "reaction" in a febrile patient, so that this index is useful only in quiescent cases. Here a latent tuberculous process may be rekindled by the injudicious use of tuberculin for therapeutic or for diagnostic purposes so that at best the remedy is dangerous. Moreover, quiescent cases usually get along very well with proper hygiene and without specific medication with tuberculin, so that the remedy in those cases precisely in which it could be used with some probability of

Curative value

Dosage

Dangers of tuberculin

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*The new method of determining the opsonic index has rendered the use of tuberculin much more safe and accurate.

success is not only dangerous in careless or unskilled hands but also superfluous.

If used at all the initial doses should not exceed one-tenth mg., and in no case should the maximum dose exceed 0.01 to 0.02 gm. Personally, I have, however, abandoned the use of tuberculin altogether. My main objection to its employment being the uncertain strength and unstable composition of practically all the tuberculins and, finally, the observation that the results obtained from proper hygiene, diet, fresh air and rest with tuberculin are no better than those obtained by the same means without tuberculin.

Creosote and its derivatives

A remedy that has for many years enjoyed popularity in the treatment of tuberculosis is creosote and its derivatives, guaiacol, creosol and cresol. While this remedy can, in no sense, be considered a specific, it certainly does good in most cases of tuberculosis and its use is therefore to be recommended.

Mode of action

Its exact mode of action is difficult to explain. It can hardly be said to possess specific anti-bacterial action against the tuberculosis germ, for animals treated with creosote and subsequently tuberculized succumb to the infection as readily as animals that have not previously been treated with creosote. Again, the sputum of tuberculosis cases, that have received large doses of creosote for a long period of time, contains as many and as virulent tubercle bacilli as that of patients who have not received the benefits of creosote treatment.

Effects

However obscure its pharmacological action may be, we know, clinically, that it increases the appetite, improves gastric and intestinal digestion and aids assimilation, hence improves the general nutrition and increases the strength of the patient; that in most cases it relieves the cough, reduces the fever and stops the night sweats. The remedy is particularly useful in early stages, but it should also be given a fair trial in advanced cases.

Contra-indications to creosote

There are distinct contra-indications to its use. Some individuals are altogether intolerant to the drug and react to the administration, even of small doses, by severe signs of intoxication, notably violent gastro-enteritis with vomiting and purging, dizziness, fainting and profuse sweats. Upon the appearance of such symptoms the administration of the drug should, of course, not be insisted upon. In other cases the symptoms of creosote intoxication are less severe and manifest themselves by milder symptoms of gastric and intestinal irritation, such as burning in the epigastrium, belching, loss of appetite, slight colic and diarrhea. In many cases as the patients become accustomed to the use of the drug these symptoms disappear, so that the administration of small doses may for a few days be tentatively continued, intermittently, in the hope that the patient will gradually tolerate the remedy. The slight discomfort from the stomach arising during this trial can well be bourne in view of the benefits to be expected from creosote if it can be taken at all.

Dose and administration

Many preparations of creosote and its derivatives have been recommended. If creosote itself is to be taken, it is best given by mouth in gelatin capsule with a little cod liver oil, for instance:

℞

Creosote,	0.1
Ol. Jecoris aselli	0.3

M. One hundred such capsules.
Sig. Five to ten capsules daily at meal time.

Or the creosote may be given in wine, as follows:

℞

Creosote,	13.5
Tincture of gentian,	30.0
Spiritus vini,	250.0
Sherry qs. ad.	1000.0

Two tablespoonfuls after each meal with a little water.—(Bouchardat and Gimbert.)

Or it may be given in five to ten drop doses in a tablespoonful of cod liver oil several times a day; or by rectum in a milk or milk-egg enema, in such a way that thirty drops of creosote are dissolved in 300 cc. of warm milk to which are added one egg and a few drops of opium.

Creosotal
Thiocol

Dose and administration

Two preparations of creosote that, in my experience, are better than creosote are creosotal and thiocol, the former being a yellowish liquid that is non-irritating and non-toxic (excepting to patients with an idiosyncrasy to creosote) even when given in large doses. It is given in drop doses in milk or water, beginning with twenty drops three times a day and increasing the dose to a tablespoonful three times a day during meals. The latter is a powder that can be given in doses of forty-five to sixty grains (3 to 4 gm.) a day in capsule or powder, best during meals, without producing any gastric or intestinal irritation. A very convenient method of administering creosotal is to give it in gelatin capsules, each containing twenty to thirty drops, four or five of these capsules being administered a day. Some patients prefer to have the remedy administered in one dose a day per rectum, especially if they are taking other medicine by mouth. Here a good plan is to mix 10 cc. of creosotal with yolk of egg, to stir this mixture into 300 cc. of warm milk, to add a few drops of tincture of opium and to inject this quantity into the rectum through a high rectal tube.

Guaiacol

Guaiacol is a useful derivative of creosote that is very popular. It may be given as the carbonate, benzoate or salicylate of guaiacol in powder form, beginning with five grains (0.3 gm.) three times a day and increasing the dose until as much as fifteen to thirty grains (1 to 2 gm.) three times a day are being taken. These guaiacol preparations are decidedly more irritating when taken by mouth than either creosotal or thiocol.

Remedies of historic interest

Innumerable other remedies have at different times been recommended as specifics in the treatment of tuberculosis, but none of these has vindicated its claim to usefulness in this disease. Among the remedies that possess the greatest historic interest and that created much sensation at the time when they were first recommended are cinnamic acid and its derivatives hetol and sodium cinnamate, copper and its salts, and nuclein. I have never been assured that these drugs are of any use whatever in the treatment of tuberculosis.

Arsenic

Dose and administration

Arsenic is a remedy that possesses no specific power over the tuberculous process but may to advantage be used in tuberculosis as a general tonic. It may be given in the form of Fowler's solution by mouth. beginning with three to five drops in plenty of water three times a day and increasing the dose a drop per dose a day until fifteen to twenty drops, three times a day, are being taken. Then the amount should be gradually reduced until only three to five drops, three times a day, are again being administered; the same cycle should be repeated several times. The maximum dose must be determined somewhat by the reaction of the patient to the remedy. If signs of arsenic intoxication, puffiness about the eyelids, epigastric distress, colic, diarrhea, itching about the palms of the hands and soles of the feet appear, then the quantity should be reduced. Arsenic may also be given by mouth in the form of sodium arseniate in the dose of one-one-hundred-and-fiftieth to one-fiftieth of a grain, in capsule with sugar of milk, three times a day, for indefinite periods of time. Sodium cacodylate, hypodermically, is one of the best preparations if it is desired to administer large doses of arsenic without danger of intoxication. It is particularly useful, aside from its action as a general tonic, in aiding absorption of pleuritic exudates forming in the course of pulmonary phthisis. It is unnecessary to give more than one-fourth of a grain of sodium cacodylate in watery solution, hypodermically, once a day, although as much as one grain, several times a day, may be given. The patients complain very shortly of a peculiar garlic odor of the breath and should be apprised of the probable occurrence of this phenomenon when cacodylate injections are made. For contra-indications to the use of arsenic and details of administering the different preparations see also the Section on *Anemia.*

Codliver oil

In addition to these remedies various medicinal substances are given in tuberculosis more as foods and to replace tissue waste than as drugs. Among these codliver oil is the most popular. It is questionable whether the iodine it contains, or the alkaloids it is said to incorporate, in any way determine its good effects in tuberculosis. It is more probable that the fat acts beneficially as a food (see page 114). Codliver oil, moreover, is a very convenient vehicle for the administration of a number of remedies (see above) and as the laity have been educated to have much faith in codliver oil, its administration generally exercises a beneficial psychic effect that is by no means a negligable quantity in the treatment of tuberculosis.

Salts

Calcium

Chlorides

Phosphates

Hypophosphites

The administration of different salts is always indicated in tuberculosis, for in this disease the urinary and fecal excretion of mineral constituents especially of the calcium salts, chlorides and phosphates* is exceedingly large. This loss should be replaced artificially, hence tuberculous patients should receive abundant table salt with their food and should receive phosphates and calcium salts medicinally. The latter can conveniently be administered in the form of calcium hypophosphite or as Syrup of Hypophosphites containing hypophosphite of calcium, potassium, sodium, free hypophosphoric acid, spirits of lemon and sugar in the dost of one to two drachms (4 to 8 cc.).

Fever

Symptomatic Treatment of Special Symptoms. Provided the fever in tuberculosis does not yield to rest, proper feeding, plenty of fresh air and the use of creosote preparations, or if the patient reacts to even slight elevations of the temperature by especially disagreeable subjective sensations, such as profuse sweating, great prostration, chills, headache, nausea; or if, finally, the fever remains persistently high so as to render it difficult to maintain the patient's general nutrition, because the consumption of his own tissues is so active, then the symptom fever must be specially treated.

Alcohol

A very simple and generally efficient means of combating slight rises of temperature is the administration of alcohol, preferably in the form of hot toddy, whenever the premonitory

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*See Croftan: The Urinary Calcium Excretion in Tuberculosis. *Journal of Tuberculosis*, 1901.

signs (chilliness, hot flushes, etc., of a febrile attack occur), also in the form of light Burgundy or Moselle wine as a table beverage. Early cases of tuberculosis, in my experience, are not so apt to develop so much fever, and especially very high degrees of temperature, if they take some alcohol as when they do not.

Antipyretics

Sometimes it becomes necessary to combat the fever by the use of certain members of the antipyretic group, namely, acetanilid, phenacetin, antipyrin, pyramidon or lactophenine. Acetanilid, phenacetin, antipyrin and pyramidon while effective in reducing the temperature are very liable to produce disagreeable sweating. Lactophenine does not seem to possess this property, hence it should be the remedy of choice (see index). Lactophenine and the other remedies enumerated above are best given in three to five grain doses about three or four hours before the rise of temperature is expected, i. e., as a prophylactic. This method of administering antipyretics is much more elegant and more efficacious, and moreover requires much smaller doses, than if the drugs are given at the height of fever.

Hydrotherapy

Hydrotherapy is not so useful nor so safe in the reduction of tuberculous fever as in the reduction of fevers due to other infections. Only very mild hydrotherapeutic measures should be employed in any case. Best of all is sponging the different extremities, the abdomen, chest and back, singly, with water of room temperature, either exposing each part of the body for a short time and immediately drying and covering it, or sponging underneath the covers. Often it is best to merely rub the hands and feet, legs, arms and trunk with the hand that is repeatedly dipped in cold water, taking each part of the body singly, rubbing dry promptly and following the wet rub by an alcohol rub and friction. Or a towel may be wrung out of cool water and placed on one extremity and the limb or arm rubbed or slapped through the wet towel. This practice is kept up for a minute or two, the wet towel removed, the limb quickly dried, rubbed with alcohol and dried again. Bath treatment or more active hydrotherapeutic means are generally objectionable in tuberculosis and should be avoided. Cleansing baths, so necessary in cases suffering from profuse night sweats, are always best given in bed with the patient lying down. Here lukewarm water should be used and the bath followed by a brisk alcohol rub and massage.

Night sweats

Alcohol, alum, vinegar, sulphuric acid washes

The night sweats of tuberculosis often call for special treatment. Here the old fashioned remedy of washing the surfaces of the body with alcohol and water, or vinegar and water, or with a one to thirty solution of alum, or a one to two hundred solution of sulphuric acid, are all useful.

Formaldehyde

Of recent years formaldehyde, in 40 per cent. solution, mixed with equal parts of alcohol, has been extensively employed. This preparation is remarkably efficacious in stopping the sweating in any part of the body and its effect usually lasts for several nights. Unfortunately the pungent and irritating odors of formaldehyde are disagreeable and may become dangerous to the patient, hence in making these applications the windows should be wide open and the patient should breathe during the application through a cloth or a sponge saturated with turpentine.

Tannoform

Salicylic acid

A useful dusting powder to control the night sweats of phthisis is tannoform. This should be powdered over the whole body every night. Salicylic acid and talcum powder mixed in the proportion of one to one hundred also forms a useful dusting powder. When this preparation is applied the patient should cover his mouth as the salicylic acid is exceedingly irritating to the throat and may produce violent coughing.

Alcohol

Atropine

Agaricin

Camphoric acid

For internal use alcohol in the form of brandy or whisky in milk or water, given in the evening, is occasionally valuable in stopping profuse perspiration during the night. Atropine in large doses, that is, in one dose of one-fiftieth of a grain (0.0012 gm.), hypodermically, or in two or three one-one-hundred-and-twentieth grain (0.0005 gm.) doses at one hour intervals, by mouth, before going to sleep is very useful. Some patients, however, cannot tolerate atropine without serious discomfort and complain of the dryness of the mouth and throat following its administration. In such cases agaricin in one-twelfth to one grain (0.006 to 0.065 gm.) doses in pill form is an exceedingly useful remedy, or camphoric acid in fifteen to thirty grain (1 to 2 gm.) doses may be given in a powder or a capsule before the patient goes to sleep.

Cough

Local treatment

The cough in pulmonary tuberculosis frequently calls for special treatment. If it is due to local causes in the pharynx, the larynx or trachea, then appropriate topical treatment, i. e., cauterization of ulcers or the application of lactic acid or insufflations of iodoform should be employed. The topical treatment of tuberculous lesions of the upper air passages should be left to the skilled specialist and the technique of this therapy need not, therefore, be described in this book. The internist, however, should always carefully examine the upper air passages for ulcers or erosion, as otherwise cough medicines, opiates, etc., that may harm the patient, upset his digestion and derange his nerves may be given in vain when simple treatment of the local condition would promptly lead to the goal.

Inhalations

Occasionally coughing can be symptomatically relieved by inhalations of steam through a steam inhaler, as described in the

Demulcent drinks

Section on *Bronchitis*. Here sodium chloride or sodium carbonate added to the water exercise a very beneficial effect. Or the patient may inhale the steam from a bowl of hot water through a paper cornucopia, or simply by covering his head and the dish with a towel, the water being medicated with a teaspoonful of tincture of benzoin, or twenty drops of opium tincture with five drops of belladonna tincture to the quart. Demulcent beverages and lozenges also frequently give relief, especially if the cough is due to local irritation in the upper air passages. A very useful demulcent beverage is the following:

℞

Sweet almond oil,	10
Mucilage,	10
Simple syrup,	10
Water,	200

Lozenges

Lozenges medicated with eucalyptus, guaiacol, menthol, chloride of ammonia, red gum are all useful.

Education

Narcotics

Opium and its derivatives

If these simple remedies fail to relieve the cough, then medicines must be given internally. In the absence of much secretion, i. e., when the cough is irritative in character but nonproductive then the education of the patient is frequently an important element in the treatment. Sufferers from any bronchial or tracheal trouble are apt to cough much more frequently and more violently than is necessary. If they are told to suppress or control the cough, when they feel a little tickling in the throat or in the chest, very much will be accomplished. Tuberculous cases especially should be educated to cough as gently as possible as there is always danger of hemoptysis and spreading of the tuberculous process into remote regions of the lung by too violent coughing efforts. In the irritative form of cough without much expectoration that cannot be controlled by the will narcotics must generally be used, especially if the patient cannot sleep on account of the coughing, or if the coughing interferes with his eating, destroys his appetite or causes vomiting. Here the whole array of opiates, opium, heroin, codeine, morphine, dionin, may be employed, as described in full under *Bronchitis.*

Expectorants

Oleoresins Balsams

If, on the other hand, the secretion is very abundant, or if there are cavities filled with secretion, then opiates should be given very sparingly. Here the various expectorants that have been fully described in the Section on *Bronchitis* should be employed (see page 282). If the secretion is very purulent, then the balsams and oleoresins should be used as in any other form of putrid bronchitis.

Position of patients with cavities

Patients with large cavities who suffer particularly from severe coughing paroxysms at night should be instructed to attempt evacuation of the cavity by lying on the opposite side to it for a time before going to sleep. If this is done evacuation of the cavity is promoted and there is less tendency to a paroxysm of cough for some hours to come, i. e., until the cavity fills up again and its contents comes in contact with healthy bronchial mucosa near the orifice of the cavity. The treatment of tuberculous cavities does not otherwise differ from that of bronchiectasis as fully described on page 283.

Digestive disorders

The digestive disorders occurring in the course of tuberculosis are of great importance and should be carefully considered in the treatment because so much depends on the proper feeding of tuberculous subjects. If there are marked gastric disorders, then a careful study of the gastric function should be made and the diet and medication arranged accordingly. In tuberculosis any variety of gastric disorder may occur from simple nervous dyspepsia to different combinations of motor, sensory and secretory perversions, acute and chronic catarrhs, ulcerative processes with stenosis and dilatation or atony of the gastric walls and amyloid degeneration of the gastric and intestinal mucosa. It will be seen, therefore, that the treatment of the stomach will have to vary greatly in each case according to the exact character of the trouble that is found.

Gastric disturbances

Intestinal disorders

Anorexia

Anorexia is a symptom that requires special discussion. It may occur in any of the above gastric disorders complicating tuberculosis, or it may occur without any marked stomach trouble. It is always a difficult condition to deal with.

Selection of diet

A tuberculous subject suffering from lack of appetite or positive aversion to food should be allowed the widest choice in the selection of his diet, provided there are no distinct contraindications, as revealed by the state of the gastric function to the use of certain articles of food that he may crave. Many cases of anorexia are produced by one-sided and forced feeding, so that here it is particularly important that the physician should not be a dogmatic doctrinaire. There are some cases in which the patient declares an aversion towards food of any kind and manifests an absolute unwillingness to eat. In such instances it may become necessary to insist upon forced feeding, the patient taking his food as he takes his medicine and, here, the diet may have to be one-sided but it should, above all things, be of the most nutritious kind. In extreme types of anorexia, especially in hysterical subjects, it may become necessary to administer food by the stomach tube, the nasal catheter, or even by rectal injection (see index), in order to prevent the patient from

Forced feeding

Stomach tube

Rectal feeding

literally starving to death. Most of these cases soon elect to eat properly rather than be subjected several times a day to the ordeal of artificial feeding.

Exclusive milk-cream feeding

In ordering an exclusive milk diet it is best to give a mixture of milk and cream, about two-thirds milk and one-third cream with a teaspoonful of brandy and a tablespoonful of lime water to each tumbler full. This mixture may be given every two or three hours during the day. If administered cold the patients rarely object to this one-sided feeding. If raw meat is given, and this food seems to be of particular value in tuberculosis, then at least 200 grammes of meat should be used in the twenty-four hours. The best method of preparing it is to scrape the raw beef, to grind the pulp in a mortar and then to press it through a sieve. It may be rendered palatable by mixing with mashed potatoes and seasoning with plenty of salt, or it may be mixed with one or two eggs and flavored with pepper and salt or with lemon juice.

Raw beef

Causal treatment of anorexia

Fever

Every case of anorexia should be submitted to careful study and the cause of the aversion to food discovered if possible. Sometimes the high fever itself disturbs the appetite of the patient, then every effort should be made by the judicious employment of antipyretics and of hydrotherapeutic means (see above) to keep the fever down. Often the administration of five grains of lactophenine, two or three hours before each meal time, will accomplish the desired result. In other cases the coughing interferes so much with eating that the patients prefer not to eat at all. Here a little codeine or dionin, or in extreme cases a hypodermic of one-fourth grain of morphine with one-two-hundredth of atropine may be given about an hour before each meal. In still other cases there is so much pain on swallowing that the patients refuse to eat for this reason. Cocaine employed locally on cotton pledgets, as a spray, or by insufflation occasionally relieves the pain and enables the patient to swallow. In less severe cases cold must be applied to the throat, both externally by the application of ice cloths and internally by swallowing ice pills. In all these cases a liquid diet consisting of broths, predigested food and the milk-cream food described above, may be given. Very hot, highly seasoned liquids should, of course, be avoided. Cases suffering from tuberculous ulceration of the larynx and the epiglottis can often swallow better lying on their stomach and sucking the liquid food through a straw.

Coughing

Pain on swallowing

Stomachics and bitter tonics

Stomachics and bitter tonics are of very little value in improving the anorexia in tuberculosis. Five to ten drops of the tincture of nux vomica, or a teaspoonful of the compound tincture of cardamoms or of gentian after meals can, however, do no harm.

Constipation

The treatment of the constipation that not infrequently develops in tuberculosis, especially if one-sided albuminous feeding is adopted and much opiate is given, will be found described elsewhere. Tuberculosis cases eating an abundant amount of fat food, however, rarely suffer from very obstinate constipation.

Diarrhea

Diarrhea, intestinal fermentation and meteorism must be treated as described in the appropriate chapters. The diarrhea of tuberculosis is a particularly obstinate symptom and dangerous, especially if it is due to ulcerative processes in the bowel or to amyloid degeneration of the intestinal mucosa.

Insomnia

Insomnia, in tuberculosis, is, as a rule, due to the cough, the fever or to the pains, pleuritic or otherwise, about the chest, or to digestive disorders, flatulency, meteorism, etc. With the removal of these causes insomnia usually improves. If it does not, then the sleeplessness must be treated symptomatically with the aid of remedies described on pages 35 and 36.

Hemoptysis

The treatment of the hemoptysis of pulmonary tuberculosis has been discussed in full in the Section on *Hemoptysis*.

III. DISEASES OF THE PLEURA.

PLEURITIS.

From a therapeutic standpoint the etiological and anatomic classification of the different forms of pleuritis is of very little value. It is clinically often a very difficult matter to differentiate between fibrinous, sero-fibrinous and fibrous pleurisy, for the reason that small amounts of fluid in so-called dry pleurisy frequently escape detection, and because many cases of fibrinous or fibrous pleurisy very gradually develop into exudative forms with liquid in the pleural cavity.

Most cases of simple pleurisy tuberculous

The opinion is prevalent that most cases of simple primary pleurisy are tuberculous in character. Hence the causal treatment would be the same as that described in the Section on *Pulmonary Tuberculosis.*

Pleurisy following exposure to cold ("Rheumatic pleurisy,")

There remain a small minority of cases of pleurisy that are not tuberculous and that follow simple exposure to cold. Whether or not this exposure acts by preparing a suitable nidus in the pleura for the invasion of micro-organisms, or whether germ infection has nothing to do with this variety, one cannot always determine; at all events the existence of an idiopathic pleuritis, following exposure to cold, must be postulated that, for lack of a better name, may be called rheumatic.

Salicylates in rheumatic pleurisy

Sodium salicylate
Salol
Aspirin
Antipyrin

This rheumatic form of pleurisy in contradistinction to all other forms is amenable to causal treatment, for, here, the salicylate preparations exercise a very apparent effect upon the course of the disease. In order to be useful salicylates must be given in large doses, either as sodium salicylate in fifteen to twenty grain (1 to 1.3 gm.) doses, four or five times a day, or as salol (phenyl salicylate) in the same doses, or, best of all, as aspirin (acetyl salicylate) in doses of thirty to forty-five grains (2 to 3 gm.) two or three times a day. Antipyrin, too, in doses of five to ten grains (0.3 to 0.6 gm.) given three or four times a day in combination with one of the above salicylates is of value in some cases.

Inefficacy of salicylates in tuberculous form

This salicylate treatment with or without antipyrin is without effect in the tuberculous variety of pleurisy and in those forms that are due to the invasion of the pleural cavity by other bacteria. If there is evidence, therefore, of a tuberculous focus or of bacterial infection anywhere in the body; if the onset of the disorder is not sudden and does not develop manifestly from exposure to cold and chilling of the body surfaces, then the above salicylate treatment is not to be employed. For no good can be accomplished by it and there is always danger of deranging the stomach and bowel and irritating the kidneys when large doses of salicylic acid or its derivatives are administered.

Treatment of acute pleurisy

Position in bed

A case of acute pleurisy upon the onset of the first symptoms of pain in the chest, dyspnea, cough and fever should be put to bed and should be kept there until the temperature is normal. The position that the patient occupies in bed should be largely left to himself, and it is wrong in these cases to be arbitrary in regard to this matter on theoretical grounds. Some patients prefer to lie on the unaffected side, especially in the beginning of the disorder, because it hurts them very much to lie on the sick side. Other patients prefer to rest on the affected side in order to aid in immobilizing the chest where it hurts and instinctively, possibly, by the pressure to reduce the local hyperemia. When much exudate has been poured out the patients almost invariably prefer to lie on the affected side, in fact most of them cannot lie comfortably on the unaffected side. This is due to the fact, self-evidently, that they wish to give the healthy side of the chest the greatest freedom for expiratory excursions.

Diaphoresis
Dover's powder
Whisky
Hot air

In the beginning of an attack of pleurisy diaphoretic treatment is often useful. Medicinally this is best brought about by the administration of a ten grain Dover's powder given with a glass of hot lemonade to which a tablespoonful of whisky or brandy is added, preferably taken in the evening before going to sleep. In addition the patient may to advantage undergo a sweat in the hot air bath. The latter can be arranged as described in the Section on *Cardiac Dropsy,* page 42, by suspending blankets over the patient supported by hoops or a wooden framework and conducting heat from an alcohol lamp, placed on the floor, through a funnel and rubber tube arrangement underneath the blanket tent. Great care should, of course, be exercised that the end of the tube from which the hot air rises does not come into immediate contact with the patient's person, as otherwise very disagreeable burns can be produced. If electricity is available in the house, then a chain of incandescent lamps can be suspended underneath the blanket tent, or inside of a wooden box constructed for the purpose, and degrees of temperature sufficiently high to cause profuse sweating generated in this way. The patient should remain in this hot atmosphere for an hour or two with cold cloths or an ice bag applied to the head. When the blanket tent is removed the patient's skin should be thoroughly dried with a rough towel and rubbed down with alcohol.

Electric light bath

In cases of pleuritis without exudate immersion in a hot bath is also a very useful procedure to bring about sweating. The patient should be placed in a bath of from 98° to 100° F'heit and instructed to lie perfectly still in the water for fifteen minutes. Here, too, an ice bag or cold cloths should be applied to the head in order to prevent reactive hyperemia of the brain. While in the bath the patient should be given plenty of water to drink. After leaving the bath the skin should be rubbed down thoroughly with a rough towel and alcohol.

Hot bathing in dry pleurisy

While these general measures are being employed every effort should be put forward to counteract the hyperemia in the pleura, and incidentally to stop the pain and the cough. This can be done by local applications to the chest, by strapping the affected side with adhesive plaster and by the administration of morphine.

Counter-irritation by the application of five or ten leeches to the skin over the pleuritic area is a very useful means of procedure, especially in the beginning of the trouble. The technique of leeching has been described in full on page 37. Wet cups with or without scarification (see page 39) are also of some use as a local counter-irritant. In early stages of pleurisy dry cups should, however, never be used as otherwise ecchymosis of the underlying pleural membranes may be produced.

Counter-irritation
Leeches
Wet cupping

One of the best and simplest counter-irritants is a large mustard plaster. This is prepared by mixing equal parts of mustard and wheat flour and moistening this mixture with warm

Mustard plaster

dilute vinegar. This mass is smeared in a thin layer on a piece of linen lying on a thick sheet of paper and another piece of linen is placed over the mixture. This plaster is laid upon the chest with the paper to the outside and left in place until burning sets in, it is then removed and the skin treated with olive oil.

Cold and heat

Ice bag
Leiter coil
Poultices

Heat and cold *per se* act as effective counter-irritants to the chest wall. Here the sensations of the patient must be our guide, some feeling very much more relieved by the application of cold to the pleuritic area, others by the application of heat. The ice bag or a Leiter coil (page 19) may serve the former purpose; poultices made of oatmeal, flaxseed or bread and medicated with a few drops of the tincture of opium or belladonna the latter.

Priessnitz compresses

The best effects are produced, however, by cool Priesnitz compresses (see index) applied by wringing a linen cloth out of water of room temperature, applying it to the affected area and covering it with a piece of flannel; this compress is left in place for three or four hours and then renewed. At the end of this time the linen will be found to be dry and the underlying skin hyperemic, showing that a counter-irritant effect has been produced.

Chloroform

Iodine

Chloroform may also be used as a counter-irritant, but, on account of its blistering properties it is not so pleasant to bear. If it is used at all, pure chloroform should be rubbed into the skin over the affected area and the treated region covered with oiled silk. Iodine, too, may be used as a counter-irritant but is not so effective as the other measures enumerated above.

Anodyne ointments

If the pain is very severe certain anodyne ointments may be used. Two very useful ones are:

℞

Menthol,	2.5
Cocaine muriate,	1.0
Vaseline,	60.0

And

℞

Chloral hydrate,	2.00
Camphor,	0.5
Vaseline,	50.00

Cantharidal plaster

In those cases in which the pleuritic process remains strictly circumscribed for several days, and very early in exudative forms of pleuritis, a cantharidal plaster applied once is of value. A piece of the plaster about six inches square is applied to the painful area and left in place six hours. The large blister that forms should be opened at once under careful aseptic precautions and with sterile instruments.

Strapping the chest

If counter-irritation fails to bring about relief, then it may become necessary to strap the chest with broad strips of adhesive plaster. The immobilization of the diseased side of the thorax that is brought about in this way is always grateful to the patient and often very effective in hastening recovery. To strap the chest one should proceed as follows: The patient is instructed to sit on the edge of the bed or to stand up with the affected side away from the physician. The middle of a strip of adhesive plaster is pressed against the axillary region of the patient while the two ends are held by the physician. The patient now presses against the strip or is pulled away from the operator by an assistant and with the chest in an expiratory position the ends of the strip are tightly fastened to the middle of the chest and back. Two or three strips of this kind may be applied according to the extent of the pleuritic affection.

Technique

Morphine for cough and pain

If the pain is excruciating and the cough very severe, then hypodermic injections of morphine, one-eighth to one-fourth grain, repeated if necessary, may have to be given. On account of the suggestive effect it is usually best to inject the morphine directly into the intercostal muscles over the painful area.

Pain referred to remote regions

In pleurisy, on account of the peculiar distribution and termination of the intercostal nerves that are being irritated, it is well to remember that the pain is frequently referred to remote regions of the body, so that a patient with a mild pleurisy may complain of severe distress in the lumbar region or in the anterior abdominal region of either side, thus simulating gallbladder or appendiceal affections, lumbago, renal colic, etc. These pains, too, can frequently be stopped by local counter-irritation over the affected area in the pleura and by the hypodermic use of morphine.

Diuresis and catharsis in exudative pleurisy

If active treatment instituted early fails to prevent the formation of an exudate, or if the patient is seen for the first time with fluid in the pleural cavity, then in addition to the measures spoken of above diuresis and catharsis must be stimulated in the hope that depletion may aid in the absorption of the exudative product.

Caffein Theobromin

The stimulation of diuresis (see also Section on *Cardiac Edema,* page 42) is of questionable value unless it is combined with the drink restriction to be discussed presently. Of the diuretics that can be employed the caffein group occupies the first

Diuretin
Digitalis
Squills

place. Caffein citrate in doses of two to eight grains (0.1 to 0.5 gm.), or theobromin in eight grain doses (0.5 gm.), or, best of all, diuretin, the double salt of sodium theobromin and sodium salicylate, in doses of eight to ten grains (0.5 to 0.6 gm.) may all be given several times a day. Digitalis and squills, the former as the extract of digitalis in doses of one-sixth to one-third (0.01 to 0.02 gm), the latter in thirty to sixty minims (2 to 4 cc.) doses of the syrup of squills, are also useful and can profitably be given combined with one of the above mentioned caffein preparations.

Sodium and potassium acetate

The acetates of sodium and potassium in doses of 15 to 60 grains (1 to 4 gm.), taken with plenty of hot water several times a day are also very useful as diuretics.

Epsom, Glauber, Rochelle salts

For the purpose of promoting catharsis salines given in concentrated form, preferably in the morning on an empty stomach, are by all means the best remedy. A tablespoonful or two of Epsom salts, Glauber salts or Rochelle salts by drawing water into the intestine by osmosis (see *Constipation*) produce some concentration of the blood and the latter in its turn becoming more concentrated than the pleuritic exudate abstracts water from the pleural cavity.

Compound infusion of senna

A useful preparation to produce watery stools is the Compound Infusion of Senna, containing as a very useful ingredient magnesium sulphate. The dose of the remedy is two fluid ounces once or twice a day. It is rarely necessary to stimulate very active catharsis by the use of jalap or elaterium.

Jalap
Elaterium

If these remedies are to be used, two to five grains (0.1 to 0.3 gm.) of the resin of jalap, or a quarter to one grain (0.016 to 0.06 gm.) of the trituration of elaterin, may be given.

Drink restriction

The good effects derived from diuresis and catharsis upon the absorption of the pleuritic exudate are often enforced by the use of a dry diet, i. e., a diet containing the minimum of liquids (see *Cardiac Dropsy*). Here the desire for water may be somewhat mitigated by allowing patients to eat ice pills, to chew gum or to suck peppermint or menthol lozenges.

Thoracentesis

As a last resort in the treatment of pleurisy with effusion aspiration of the fluid by thoracentesis must be considered. It is often a difficult matter to decide just when to tap the chest.

When to aspirate

Axiomatically one may say that it is always better to aspirate too soon than too late, for if the pleuritic exudate is allowed to remain in the pleura too long the lung is very apt to lose its elasticity and its power of expansion, and interstitial pneumonia, carnification of the lung and bronchiectasy are quite liable to develop. Moreover, if the exudate is very large, so that it compresses the lymph stomata in the pleura, absorption of the fluid is automatically prevented.

Indications for thoracentesis

Thoracentesis in hemorrhagic exudates

The chief indications for thoracentesis are persistence of the exudate at the expiration of three or four weeks and despite the employment of all the measures spoken of above; then, bilateral exudative pleurisy developing rapidly and producing severe orthopnea; and, again, severe subjective symptoms due to dislocation of the heart with twisting or compression of the large vessels at the base of the heart, with pulmonary edema, cerebral anemia, peripheral cyanosis, stasis in the abdominal viscera and other remote symptoms that can be directly attributed to the presence of fluid in the pleural cavity. Finally, tapping of the chest may become necessary as a palliative measure in carcinomatous and sarcomatous processes involving the pleura. In the latter class of cases the fluid is usually hemorrhagic in character and almost invariably reappears after thoracentesis. Here, therefore, one should be conservative in tapping the pleura, for the repeated hemorrhages into the pleural cavity are without doubt weakening to the patient, so that the removal of the fluid, in this class of cases, should be undertaken only when the subjective symptoms become distressing or directly endanger life.

Dangers of thoracentesis

Preparation for thoracentesis

The dangers incident to the operation of thoracentesis are often grossly exaggerated. It is true that accidents may happen after withdrawal of fluid from the chest under rigid asepsis, or if the fluid is too rapidly removed, especially if due care is not exercised in working, notably embolization of cerebral or pulmonary arteries, syncope from cerebral anemia, paralysis of the heart, pneumothorax, empyema, expectoration of albuminous sputum, etc. If the aspiration is carried out carefully and if emergency remedies are kept at hand to prevent all possible complications about the heart and circulation, then thoracentesis is fraught with very slight danger. One should have ready, therefore, for such emergencies, analeptics, i. e., a hypodermic syringe filled with a ten per cent. solution of camphor in ether and a hypodermic of one-thirtieth grain of strychnine sulphate, also some smelling salts and a small glass of brandy or whisky.

Morphine before thoracentesis

Before performing thoracentesis it is always best to give the patient a quarter of a grain of morphine, hypodermically, to quiet him and to subdue his fear and excitement somewhat, so that he may co-operate with the operator to the best of his ability and also to prevent, as far as that is possible, the cough which so frequently follows withdrawal of pleuritic exudate.

Technique

The little field of operation should be rendered thoroughly aseptic by scrubbing with soap and water and 1:2000 bichloride solution, alcohol and ether. A preliminary puncture should always be made with a hypodermic needle in order to ascertain

Diuretin
Digitalis
Squills
Sodium and potassium acetate

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Technique

The little field of operation should be rendered thoroughly aseptic by scrubbing with soap and water and 1:2000 bichloride solution, alcohol and ether. A preliminary puncture should always be made with a hypodermic needle in order to ascertain

Asepsis

with certainty that fluid is present about the spot where it is intended to insert the trocar, and also in order to insure the absence of a pleuritic adhesion at the point within the area of dullness that has been selected for the puncture.

The place of puncture

In the anterior axillary line

At the outer angle of the scapula

In selecting the place of puncture two regions are usually considered. Either a point in the fifth, sixth or seventh interspace in the anterior axillary line, or a point posteriorly in the seventh or eighth interspace near the outer angle of the scapula. The former location is the better of the two, for while the bulk of the fluid usually accumulates posteriorly after the patient has been lying down for days, so that the insertion of the needle at the angle of the scapula is most apt to strike the fluid, still the posterior intercostal spaces are narrower and the muscles of the back are thicker than in the axillary line, so that the needle must be pushed in deeper and must overcome more resistence. The fluid, moreover, in the posterior part of the chest is apt to contain more abundant flakes of fibrin than in front, owing to the fact that the latter sink by gravity; consequently posteriorly there is always more risk of occlusion of the needle.

Danger of wounding the diaphragm

The puncture should always be made as low down on the thorax as possible, care being taken, of course, not to wound the diaphragm. The exact location of the diaphragm is, therefore, best determined first on the healthy side and its corresponding location on the sick side estimated therefrom.

Position of the patient

The patient should be instructed to sit up and to place the arm of the affected side on the opposite shoulder as this broadens the intercostal spaces. Then, as a rule, the needle is inserted quickly into the fifth or sixth interspace, close to the upper margin of the rib to avoid injuring an intercostal artery.

Local anesthesia

If necessary local anesthesia may be produced by an ether spray or a chloride of ethyl spray, and if it is desired to facilitate the entrance of the needle still more and to reduce the pain to a minimum, a small incision through the outer integument in the anesthetized area may first be made. The entrance of the needle into the pleural cavity can readily be determined by a certain "give."

Aspiration of the fluid

The fluid is now withdrawn either with the aid of a Potain or Dieulafoy aspirator, although these complicated apparatuses are rarely necessary. The object of using them is to prevent the entrance of air into the pleural cavity. This accident can very readily be prevented in a simple manner by connecting the trocar with a small rubber tube about three or four feet long into the end of which a small funnel is inserted; close to the needle a clamp compresses the rubber tube. The funnel, tube and needle are filled with a four per cent. boric acid solution, the clamp closed, and, during the insertion of the needle, the funnel held high by an assistant. As soon as the needle enters the pleural cavity the clamp is removed and the funnel lowered into a vessel containing four per cent. boric acid solution. In this way the exudate is removed by direct drainage under slight negative pressure and there is practically no danger of air entering the pleural cavity. The rapidity of the out-flow can be governed by the clamp.

Dressing the puncture

After enough of the fluid has been withdrawn the skin is squeezed tightly about the needle and the latter very rapidly abstracted. The little wound is quickly covered with a piece of court-plaster or with a small strip of iodoform gauze that is glued to the skin with collodion; usually no other dressing is required.

Quantity of fluid to be withdrawn

The amount of fluid to be drained off varies according to individual peculiarities of the case and the reaction of the patient. Upon the first appearance of syncope the needle should at once be withdrawn and the aspiration of fluid stopped. In very large exudates as much as a litre or a litre and a half of fluid may be slowly withdrawn with impunity. It will rarely be necessary, however, to take away more than 500 cc.

After treatment

After the thoracentesis has been performed the patient should remain in bed, hot applications or counter-irritation (see above) should be applied to the chest and diuresis and catharsis stimulated. At the same time in order to promote the expansion of the lung the patient should be instructed to take twenty or thirty deep, forced inspirations several times a day, raising the hands above the head with each expiratory effort or, better still, he should perform expiratory movements against pressure, either in a pneumatic cabinet or simply by slowly inflating a large rubber bag two or three times a day.

Empyema and pneumothorax

If the contents of the pleura is purulent (empyema), or if air enters the pleura (pneumothorax) through the chest wall after trauma or from perforation of a pulmonary or bronchiectatic cavity, or from the esophagus, stomach or colon as the result of ulcerative perforation, then the treatment becomes surgical.

Treatment of purulent pleurisy

The only treatment of a purulent pleurisy is free incision and drainage, if necessary with resection of portions of one or more ribs. No case should be considered too desperate to attempt this operation, as remarkable improvement is generally seen in these cases when drainage is established and the pus is freely evacuated. As a precautionary measure thoracentesis may be attempted when the services of a competent surgeon cannot at once be secured, or if the patient is in so reduced a condition that the evacuation of some of the pus by means of a trocar is deemed a conservative preliminary measure instituted in order to give the patient more strength and resisting power to withstand the shock of the later operation or, finally, if it is desired to withdraw large accumulations of pus gradually for fear of endangering the patient's life by suddenly changing the pressure equilibrium in the thorax. In all these instances thoracentesis must, however, always be considered merely as a palliative and not as a curative measure, notwithstanding the fact that very rarely an empyema gets well from simple aspiration of pus by tapping. The latter fortunate issue can never be counted upon.

The after-treatment of empyema following evacuation of the pus does not differ materially from that employed after thoracentesis for simple pleurisy. Special attention should be directed toward promoting free expansion of the lungs by forced expiration exercises against pressure (inflating a rubber bag, blowing bubbles through a water bottle, breathing in a pneumatic chamber, etc.), because in purulent pleurisy in particular there is a tendency to the formation of tough adhesions that seriously interfere with the expansion and aëration of the lung and hence prevent restitution to normal conditions.

Treatment of pneumothorax

In pneumothorax there is usually some fluid in the pleural cavity (rarely serous or sero-fibrinous, generally hemorrhagic or purulent); so that in many of these cases thoracentesis becomes necessary. If in simple pneumothorax the intra-thoracic pressure becomes very high so that the dislocation of the thoracic viscera, the excessive compression of the lung with great pain, distressing dyspnea, venous congestion about the head and the serious interference with the heart's action renders the condition of the patient unbearable, then puncture of the chest wall may be performed for the purpose of allowing the escape of some of the air and rendering the pressure within the pleural sac equal to the atmospheric pressure. In valve pneumothorax this procedure may have to be repeated at frequent intervals.

If the pneumothorax develops suddenly from the perforation with a sharp pain, profound dyspnea, a weak heart's action, lividity and symptoms of collapse, then a hypodermic injection of one-fourth grain of morphine should be given at once, and repeated if necessary. The heart, at the same time, should be supported by analeptics (see page 32); hot poultices, a mustard plaster or one of the anodyne preparations enumerated above must be applied to the chest wall until the most violent symptoms have subsided. The subsequent treatment, until thoracentesis or thoracotomy are performed, does not differ materially from that of any other form of pleurisy.

CHAPTER VIII.

DISEASES OF THE DIGESTIVE APPARATUS

THE STOMACH.

ACUTE GASTRITIS.

Acute gastritis, whether due to over-eating or to the ingestion of indigestible articles that irritate and overtax the stomach, or to alcohol, or to infectious agencies, calls for rest of the stomach and prompt evacuation of the offending material. As a rule these two postulates are promptly fulfilled by Nature, inasmuch as the patient both manifests a violent aversion for food and promptly responds to the ingestion of food by nausea and vomiting, or vomits spontaneously. Many cases of acute gastritis recover within a few days if not interfered with, especially if they receive neither food nor medicine.

Evacuation of the stomach

Abstinence from food

To control thirst

During the period of enforced or voluntary fasting most of the patients complain only of thirst, and this should be appeased either by repeatedly washing out the mouth (a procedure that is especially agreeable to the patients on account of the bad taste and bad breath that usually accompanies acute gastritis) with some simple mouth wash (see page 260), or by swallowing ice pills or teaspoonful doses of ice water, ice cold lemonade or orangeade, or very dilute hydrochloric acid. Small swallows of ice cold carbonated waters are particularly agreeable and soothing to the stomach, because the alkali of the water aids in dissolving the mucus and the carbonic acid exercises a slightly anesthetic effect upon the irritable mucous lining of the stomach.

Should the stomach not spontaneously get rid of its contents by vomiting, then the evacuation of the stomach contents should be artificially promoted either by producing emesis or preferably by lavage.

Emetics

Ipecac

Tartar emetic

The ordinary emetics, as ipecac, tartar emetic, etc., should never be given by mouth on account of the irritating effect they exercise upon the already hyperemic gastric mucosa; besides, they take considerable time to produce their effect, and delay may be dangerous, especially in children. Sometimes such simple measures as drinking lukewarm water, tickling the pharynx with the finger, are effective in producing vomiting, especially in patients who vomit easily. Some people, however, vomit with great difficulty, or fail to vomit at all with the aid of these simple measures, then the stomach contents is not completely evacu-

Lukewarm water

Apomorphine

ated; under such circumstances apomorphine given hypodermically, in watery solution, in the dose of a twentieth to a tenth of a grain (3 to 6 mg.), repeated, if necessary, is a useful remedy.

Lavage

Best of all, however, is lavage of the stomach either with warm water or, better still, with a dilute soda solution containing one teaspoonful of soda to the quart of water; for the soda aids in dissolving the mucus that coats the inner gastric walls.

Many kinds of apparatus have been devised for performing lavage of the stomach. It is unnecessary to employ the complicated systems of funnels, tubes, clamps and glass connections that have been described. The latter are chiefly useful in the treatment of chronic gastric disorders, and for use by the patient himself, or by the inventor of the device.

Apparatus to be used

For ordinary use at home a simple stomach tube and a glass funnel, or a stomach tube with an aspirating bulb, are the most convenient and the simplest to employ. If the funnel is used, the stomach contents is removed by siphonage; if the bulb is used, by aspiration. The tube should be smooth and soft. Stiff tubes with longitudinal ridges should not be used.

Introduction of the stomach tube

The introduction of the stomach tube should never be attended with much difficulty. Inasmuch as it is usually more difficult for the physician and less agreeable to the patient to have the stomach tube passed in the recumbent than in the upright position, it is best, especially if lavage of the stomach is being performed for the first time, to have the patient sit up opposite to the physician with the head slightly bent forward. Before introducing the stomach tube the manipulation that it is intended to perform should be carefully explained to the patient and assurance should be given that the tube will be promptly withdrawn if it does not slide down easily, or if it produces gagging or choking. In excitable or nervous subjects the physician should continuously speak to the patient, encourage him to breathe deeply and to keep his mouth open and to perform swallowing movements until the tube enters the stomach. The tube should be moistened with water (not with oil, vaseline or glycerin) and advanced to the pharyngeal wall: the patient should then be told to perform swallowing movements, with the head bent slightly forward and to continue swallowing while the physician pushes the tube down until it reaches the stomach.

Expression

The patient may now attempt to express the stomach contents by retracting the abdominal muscles and straining: in this way a large proportion of the offending material may often be evacuated. If this manipulation does not bring out any of the stomach contents, then a large funnel holding about 500 cc. should be inserted into the free end of the stomach tube and held about two feet above the patient's mouth and a dilute soda solution (see above) poured into it. As soon as most of the fluid has passed down, the funnel should be lowered below the level of the stomach and the contents removed in this way by siphonage. This manipulation should be repeated several times until the wash water comes out clear. If the patient shows considerable tolerance for the stomach tube, then it is well to have him lie down with the tube in place and to perform lavage again in the recumbent position. It will often be found that in this way considerable material will be removed from the stomach, even if the wash water came out quite clear while the patient was sitting up. In order to avoid retention of the wash water in the stomach it is best to catch the water returning from the stomach in a graduated vessel and to measure carefully the amount of water poured in and the amount recovered from the stomach.

Syphonage

Lavage in recumbent position

Accidents to be avoided

If the water is poured into the funnel too quickly a vortex is often formed and, in this way, considerable air is sucked into the stomach; when this occurs the funnel should be held in a slanting position at once, and the aspiration of air will stop. Quite frequently when the patient begins to perform vomiting movements the wash water pours out alongside the tube; this is due either to pouring the water in too quickly or under too great pressure; the remedy, therefore, is to pour the water more slowly and to lower the funnel. If the tube has been pushed in a little too far so that it touches the sensitive mucosa at the fundus, then vomiting and retching may also occur; here withdrawal of the tube an inch or two will frequently stop the patient's distress and the pouring out of water through the mouth.

Withdrawing the tube

The tube should be withdrawn with some water still in the funnel. It is always dangerous to let all the water run out of the funnel as, in this way, considerable air may be pumped into the stomach upon a second washing or in withdrawing the tube some of the mucosa may be pulled off. In removing the tube, therefore, it should be withdrawn with the water still flowing until its lowest point is well above the cardia. As soon as the tip of the tube is out of the stomach, the tube should be compressed below the funnel and drawn out quickly.

Aspiration

Many of the accidents and disagreeable complications spoken of above can be avoided by using an aspirating bulb instead of a funnel. The tube is inserted as described above, the aspirating bulb compressed and attached to the open end of the stomach tube and then allowed to expand, and in this simple way the stomach contents aspirated. In order to perform lavage with the aspirating bulb the bulb is filled with water, the water pressed into the stomach and removed immediately by allowing the bulb to expand; the tube should be withdrawn with the bulb expanded.

Laxatives

Evacuation of the stomach contents usually brings prompt relief. Often spoiled or fermenting food has passed on into the bowel before the stomach contents is evacuated, then emptying of the bowel may also become necessary. This is best brought about by the use of castor oil in tablespoonful doses; for the latter (aside from frequently producing nausea and thereby emesis) exercises a rapid purgative effect. Calomel, too, is a useful remedy in these cases, for it acts as a cholagogue, a rapid evacuant and an antiseptic. It should be given in doses of two to three grains (0.13 to 0.2 gm.), or in several doses of a half grain (0.03 gm.) every hour for four or five doses, followed within a few hours after the administration of the last dose by a tablespoonful of castor oil or a saline laxative (see also page 414).

Castor oil

Calomel

Diarrhea

This practice usually stops the diarrhea that is apt to supervene if evacuation of the irritating bowel contents is not promptly brought about. It also successfully counteracts the obstinate constipation that sometimes complicates acute gastritis. It is always bad practice to attempt to check the diarrhea by the use of opiates, tannic acid or other anti-diarrheic remedies before complete evacuation of the putrid bowel contents has been promoted.

Constipation

Bowel irrigation

In addition to producing evacuation of the bowel by the administration of castor oil or calomel by mouth, bowel irrigation with oil or with glycerin in water or soapsuds in water is very useful. By cleansing the lower bowel the colicky pains are often relieved, for the latter are chiefly produced by the increased peristaltic movements of the small intestine and are rendered more severe if an obstacle to the evacuation of the bowel contents is offered by impaction of the colon with solid fecal material.

Pain

The pain and the distress in the epigastric region usually disappear within a day or two if the above measures are adopted. If the pain persists or is very severe, a Priessnitz compress applied to the epigastrium generally acts as an effective counterirritant and analgesic. Such a compress is applied by laying

Priessnitz compress

Heat
Morphine
Belladonna
Cocaine

a linen cloth, wrung out of cool water, upon the epigastrium and covering it with a piece of flannel. This application should be repeated every two or three hours. Sometimes a hot water bag over the stomach or a thermophore (see index) are grateful to the patient. In extreme cases with much pain and very persistent vomiting a hypodermic of an eighth of a grain of morphine with a two-hundredth of atropine, or opium with belladonna in suppository of the extract each ½ gr., may have to be given; or if there is very much hyperesthesia of the gastric mucosa, cocaine as described on page 19 may be administered.

Diet

After a period of starvation lasting for twenty-four to forty-eight hours some food should, by all means, be administered. The diet should at first be liquid and cold and should be given in small quantities, beginning with teaspoonful doses of cold milk or thin gruels made with water or milk, possibly with an egg stirred in. Later, as the patient recovers, easily digestible foods should be administered in gradually increasing quantities.

THE DIGESTIBILITY OF FOODS

This question of digestibility is a difficult one. As a rule the criterion of digestibility is considered to be the length of time that an article of food remains in the stomach, and a number of tables have been arranged by different clinicians, giving a scale of digestibility based on this standard. The following, by Pentzoldt, is one of the most reliable, and has the advantage, moreover, of giving the quantities of the different foods:

The stomach normally empties itself of the following articles in the time named:

SCALE OF DIGESTIBILITY.

Within one or two hours.

100-200 cc. water, pure.
200 cc. water, carbonated.
200 cc. tea.
200 cc. coffee.
200 cc. cocoa.
200 cc. beer.
200 cc. light wine.
100-200 cc. milk, boiled.
200 cc. meat broth without additions.
100 gm. eggs.

Within two or three hours.

200 cc. coffee with cream.
200 cc. cocoa with milk.

200 cc. malaga wine.
300-500 water.
300-500 beer.
300-500 milk, boiled.
100 gm. eggs, raw, hard boiled, or as omelette.
100 gm. beef, raw sausage.
250 gm. calf's brains, boiled.
250 gm. sweetbreads, boiled.
72 gm. oysters, raw.
200 gm. carp, boiled.
200 gm. pike, boiled.
200 gm. codfish, boiled.
150 gm. cauliflower, boiled.
150 gm. cauliflower, salad.
150 gm. potaoes, boiled.
150 gm. mashed potatoes.
150 gm. stewed cherries.
150 gm. raw cherries.
70 gm. white bread, fresh and stale, dry or with tea.
70 gm. zwieback, fresh and stale, dry or with tea.

Within three or four hours.

230 gm. young boiled chicken.
220-260 gm. squab, boiled.
195 gm. squab, roast.
230 gm. partridge, roast.
220-230 gm. young chicken, roast.
250 gm. beef, raw, boiled (lean).
250 gm. calf's feet, boiled.
160 gm. ham, raw and boiled.
100 gm. veal, warm and cold (lean).
100 gm. beefsteak, broiled, cold and warm.
100 gm. beefsteak, raw, scraped.
100 gm, roast beef.
72 gm. caviar, salt.
150 gm. brown bread.
150 gm. Graham bread.
150 gm. white bread.
100-150 gm. Albert biscuits.
150 gm. potatoes, vegetable.
150 gm. rice, boiled.
150 gm. carrots, boiled.
150 gm. spinach, boiled.
150 gm. cucumber salad.

150 gm. radishes, raw.
150 gm. apples.

Within four or five hours.

210 gm. squab, broiled.
250 gm. fillet of beef, roast.
250 gm. beefsteak, broiled.
250 gm. beef tongue, smoked.
250 gm. rabbit, roast.
240 gm. partridge, roast.
250 gm. goose, roast.
280 gm. duck, roast.
200 gm. salt herring.
150 gm. lentil purée.
150 gm. string beans, boiled.

Definition of digestibility

The length of time during which an article of food remains in the stomach is not, however, the only measure of its digestibility, especially in pathological cases; for, broadly speaking, an article of food may be considered digestible, first, if it produces no disagreeable subjective symptoms; second, if it does not over-tax either the motor or the secretory powers of the stomach. The element of idiosyncrasy also enters into the equation here; for an article may be very well digested in the stomach but not be well borne by the patient or, on the other hand, it may be well borne, i. e., cause no subjective symptoms of distress and still may leave the stomach in a practically undigested form to undergo, finally, disassimilation in the intestine. In either case the article must, insofar as the stomach is concerned, be considered indigestible, for it fails to meet the prime requirements of a digestible article, i. e., neither to over-tax the motor, the secretory or the sensory function of the diseased organ. In pathological cases where the perversions of these three functions are frequently associated this applies with particular force, as will be shown later when discussing chronic disorders of the stomach and the functional perversions of the organ.

In this place, however, some general considerations in regard to the utility of different foods in stomach disorders, i. e., their digestibility in a broader sense, may be inserted.

Digestibility of meats

The digestibility of meats depends upon their origin, upon the amount of fat they contain and their mode of preparation. The most digestible varieties of meat are poultry, especially chicken and squab; less digestible are duck and goose. Veal, if sufficiently aged (see below) and properly prepared, comes next in the stage of digestibility, then fish with the exception of the fat varieties like trout, mackerel, pickerel and salmon; less digestible than the above are beef, pork and mutton.

The fat of meat

The more fat meat contains the less digestible it is; for fat is not at all digestible by the juices of the stomach and as it surrounds the muscle fibers it protects them from the action of the gastric juices, so that a large proportion of the albuminous constituents of fat meat pass from the stomach into the intestine practically undigested.

Raw meat and cooked meat

Raw meat is more digestible than meat cooked in any way, especially if it is chopped or scraped, for in this manner the connective tissue fibers are torn and macerated and free access to the muscle tissue is given to the gastric juice. Rare meats are always more easily digested than meats that are well done.

Methods of cooking meat

Boiled, stewed or roast meats are about equally digestible; their nutritive value, however, varies according to the method of cooking. If the meat is placed at once into boiling water, the albumens on the surface are promptly coagulated, so that the nutritive ingredients of the meat are retained. If it is intended to make stew, i. e., to extract the nutritive ingredients, then the meat should, of course, be placed into cold water which is gradually heated to the boiling point. The same principle obtains in roasting meat; it remains most nutritious if it is exposed at once to great heat, for in this way the coagulate that forms on the outside prevents the nutritive juices from running out into the pan.

Smoked, cured corned meats

Smoked, cured and corned meats are less digestible than raw or cooked meats, because they contain creosote and similar products that are generated during the process of smoking and curing, and these creosote preparations materially interfere with digestion. The large amount of salt contained in salt meats and fish is also detrimental, so that the digestibility of the latter foods must be estimated as low.

Fresh and "hung" meat

Meat in order to be digestible should not be too fresh, for, if eaten within a few hours after the animal is killed, i. e., while the muscle tissue is still in a state of *rigor mortis*, the coagulated myosin renders the meat fibers difficult of digestion. After hanging for a time lactic acid forms and softens the connective tissues while bacteria cause dissolution of the myosin coagulate. The meat should, of course, not hang too long nor in too warm a temperature, as otherwise putrefactive processes may set in with the formation of ptomaines. "High" game and poultry, therefore, are very detrimental in any stomach disease. As poul-

"High" meats

try is eaten almost immediately after it is killed, i. e., before myosin coagulation occurs, both the above difficulties are usually obviated.

Broths

Meat broths contain salts, extractives, kreatinin, gelatin, a little albumen and peptones, hardly any fat, and water; their nutritive value, therefore, is very small. They act chiefly as stimulants to the flow of gastric juice and, through the extractives they contain, as stimulants to the nervous system and the circulation. Unless contra-indicated by conditions of the stomach in which it is desired not to dilute the gastric juice or to over-tax the weak gastric musculature by the ingestion of much fluid, meat broths fulfill a useful purpose.

Albumoses and peptones

So-called peptones and different predigested foods contain albumoses; the latter are more easily assimilable than native albumen, and they can replace albumens to some extent. Inasmuch, therefore, as they are nutritious and non-irritating to the stomach wall they serve a useful purpose, especially in gastric catarrh. Their taste unfortunately is disagreeable to many people and occasionally they produce diarrhea.

Gelatin

Gelatinous foods, in small quantities, are a very useful addition to the diet in the form of gelatin, aspic, meat jellies, calves' head, etc.; they are non-irritating to the stomach, but also occasionally produce diarrhea.

Eggs

The digestibility of eggs depends exclusively upon their mode of preparation. Soft boiled eggs and eggs stirred in soups or poached very soft are the most digestible of all; raw eggs, fried eggs and hard boiled eggs the least digestible. The white of egg is more digestible than the yolk on account of the fat that the latter contains. A very digestible and very nutritious preparation is a watery solution of egg albumen with a little salt.

Milk

Milk constitutes a very nourishing, digestible and non-irritating food, so that it should occupy a large place in the dietary of stomach cases. Some people possess a distinct idiosyncrasy against milk, manifesting not only a thorough distaste for it in any form, but also an inability to properly digest it. The latter difficulty may occasionaly be overcome by the addition of lime water, soda, magnesia or brandy, all ingredients that are intended chiefly to change the character of the curds that form in the stomach. If milk cannot be taken, buttermilk, kephyr, kumyss or solutions of condensed milk serve an equally useful purpose. There is no difference in digestibility between raw or boiled milk.

Gruels

Inasmuch as milk, as shown in a previous section (see page 208) cannot fulfill the caloric requirements of an individual if given as the exclusive article of diet, it is best to add to it certain cereals, as wheat, barley or oatmeal flour, rice, sago, tapioca, or one of the many dextrinized foods that are on the market. The addition of these various substances in no way renders the milk less digestible and materially adds to its nutritive value, so that the patient can subsist for a long time upon gruels made with milk in this way.

Vegetables

Among vegetables, potatoes and other vegetables growing under ground and those growing in pods are most nutritious and most digestible, especially if served boiled in water or, best of all, mashed or as purées. Leafy vegetables are not very nutritious, contain abundant cellulose, which is not at all digestible, and frequently acids, which may be harmful in diseases of the stomach. Salads, therefore, prepared with oil, vinegar and spices are to be especially avoided in stomach diseases; for the character of the leaves from which the salads are made, the fat, the acid and the spices all render salad harmful. Very digestible and nutritious vegetables are cauliflower, asparagus (especially the heads), spinach and string beans.

Fruits

Fruits should be given sparingly in stomach diseases for they contain abundant cellulose, free acids and much sugar and are very commonly contaminated with bacteria. The least harmful fruits are apples and pears, better given stewed than raw. Grapes, too, are very useful. Berries on account of the seeds and acids they contain, cherries, plums and peaches on account of the acids and the abundant cellulose are not very good. Nuts are very indigestible. A useful preparation of nuts, however, is so-called nut-milk made from ground almonds or other nuts mixed with four or five parts of water and two or three parts of milk. Such nut emulsions are very soothing to the stomach and are also nourishing on account of the albumens, fats and sugar they contain.

Nut emulsions

Bread stuffs

Of bread stuffs the best are toast, crackers and zwieback. Stale bread is always better digested than fresh bread, especially hot bread. The crust of bread is by far preferable to the soft portions; for the former is better dextrinized and hence partially predigested and, moreover, requires more thorough mastication, hence preliminary dextrinization in the mouth, than the soft part of the bread. Breads made of coarse flours require a very active gastric juice and should never be given if the gastric function is weak; they have a distinct place, however, in the treatment of some gastro-intestinal diseases, especially where it is desired to stimulate peristalsis of the intestine. The so-called diabetic breads described on page 126 are digestible and nutritious without being irritating to the stomach, hence they are very useful in stomach disorders.

Sugar Sugar is introduced either in the form of cane sugar in ordinary table sugar and some vegetables; or as dextrose or levulose in grapes, honey and certain fruits; and as lactose in milk. Inasmuch as dextrose and levulose are absorbed directly and rapidly, whereas cane sugar must first be split (inverted) into dextrose and levulose before it can be absorbed, it is clear that the administration of the former sugars is more rational than that of cane sugar: for the latter is forced to remain in the stomach and upper portion of the bowel longer than dextrose or levulose; hence fermentation is more apt to occur with gaseous distention of the stomach and bowel if cane sugar is given than if sugar is administered in the form of dextrose or levulose. It has been established, moreover, that cane sugar retards the digestion of the albumens and fats to some extent. In stomach diseases, therefore, cane sugar should be given sparingly and the demands of the patient for sweet foods should largely be satisfied by the administration of honey or dextrose.

Fats The digestibility of fats is approximately proportionate to their melting point; the lower the melting point the more digestible they are as a rule; thus vegetable oils and the milk fats, i. e., butter and cream and milk, are by far more digestible than animal fats. The digestibility of the latter, moreover, is impaired by the fact that the fat is enclosed in a tough cell membrane.

Beverages Of beverages, water in large quantities should always be avoided in stomach diseases, for it taxes the motor power of the stomach, retards digestion and dilutes the gastric juice. Sufferers from stomach disorders should, therefore, refrain from drinking much water immediately before, during or after meals.

Coffee
Tea The use of coffee in stomach cases must be largely governed by the reaction of the patient. Tea and coffee, *per se*, exercise no effect upon gastric digestion, itself. In some persons they act upon the nervous apparatus, producing certain symptoms about the higher cerebral centers and also somewhat stimulating peristalsis. The prejudice against coffee and tea in stomach diseases is largely exaggerated. If a choice is to be made between the two, tea, empirically, is probably less harmful than coffee. It is generally a superfluous restriction to forbid the use of small quantities of coffee, especially for breakfast, to people who have been used to this beverage all their lives.

Alcohol The use of small quantities of alcoholic beverages is generally useful in stomach disorders. That alcohol in any form should be avoided in acute gastritis need hardly be emphasized, but in more chronic varieties of stomach disorders, especially in certain functional disturbances, small quantities of alcohol act as a stimulus to the motor power and the secretion of the stomach, increase the appetite and materially aid in the digestion of fats by promoting the evacuation of the latter from the stomach. It is true that alcohol precipitates pepsin, but this disadvantage is more than overbalanced by the advantages enumerated above. Most cases of chronic stomach trouble are benefited by the use of a little brandy, a liqueur or Sherry after meals or by drinking a glass or two of light Claret, Burgundy or Moselle wine during their meals.

Brandy, liqueurs, Claret, Moselle

Cider

Beer

Cider on account of the large quantity of acid it contains is not so useful a beverage. Beer should be forbidden, for it contains abundant carbonic acid gas which distends the stomach, especially as it is always taken in relatively large quantities, hence violates the principle of restricting the liquid intake during and before meals. Beer, moreover, unless pasteurized, contains yeast cells which are very apt to set up fermentative processes in the stomach and bowel. Small quantities of champagne are useful both on account of the alcohol and the carbon dioxide they contain. Large quantities should, however, never be given because of the danger of distending the stomach from the rapid evolution of gas.

Champagne

Smoking

Smoking, finally, should never be permitted in acute gastric disorders. In other gastric troubles it should never be allowed when the stomach is empty, for it undoubtedly reduces the appetite. A cigar or two a day, however, especially in men who have been accustomed to the use of tobacco all their lives, indulged after meals can do no harm and it is a cruel and unnecessary restriction to dogmatically forbid the use of tobacco in every case of stomach disorder.

CHRONIC GASTRITIS.

Causes

Chronic gastritis may develop consecutively to a number of primary disorders about the heart, the liver, the kidneys and the lungs. In all these conditions disturbances of the circulation leading to venous stasis in the stomach or portal stasis are responsible for the gastric catarrhal symptoms. In many metabolic disorders, in severe anemia and leukemia, chronic gastritis is an important phenomenon. Chronic gastric catarrh may also accompany certain organic diseases of the stomach like carcinoma, ulcer, ectasy.

Chronic gastritis does not invariably accompany these different diseases, hence the existence of special factors must be postulated in many cases that determine the development of catarrh. Chief among the latter are any of the agencies that have been enumerated in the preceding section as producing acute gastritis, especially if these agencies remain operative for a long time. Indiscretions in diet, that is, eating the wrong food or too much food, fast eating, failure to properly masticate the food, the abuse of alcohol, the excessive use of spices, of hot foods and of medicines, chiefly purgatives, can all cause chronic gastric catarrh. All these factors may also produce chronic gastritis without the presence of any of the general disorders mentioned above, either by causing acute gastritis, which is neglected, or which frequently recurs and finally becomes chronic, or by producing slow, gradual involvement of the gastric mucosa, so that chronic gastritis insidiously develops.

Causal and prophylactic treatment

In instituting causal and prophylactic treatment in chronic gastritis all these elements must be considered. Any circulatory disorder that may be present must be corrected, if possible, by the use of all those measures that can counteract venous stasis in the general circulation and chiefly in the portal area. The renal, pulmonary, metabolic, hematic disorders that may be present must be carefully treated as described in other sections.

In chronic gastric catarrh two elements predominate, there is first an excessive secretion of mucus and second, a perversion of the gastric secretion generally manifesting itself by a deficient outpouring of digestive ferments and of hydrochloric acid; (in rare cases, however, there may be hyperchlorhydria). The food introduced into the stomach owing to these abnormal conditions fails to undergo proper disassimilation and hence stagnates, especially as the chronic inflammation of the stomach wall often leads to weakening and atony of the gastric musculature; consequently abnormal fermentation of the gastric contents commonly occurs and the condition is further aggravated by the formation of irritating poisonous acids, ptomaines and gases.

General indications for treatment

The indications for treatment are to remove the mucus; to correct the perversion of secretion; to administer a diet that spares the gastric function and that can be promptly propelled onward into the intestine; to remove the irritating products of fermentation; and, last of all, to stop the fermentative processes, so far as that can be accomplished, by the use of appropriate measures.

Lavage

In order to remove the mucus, lavage is the sovereign remedy. In chronic gastritis the stomach should be washed persistently.

In mild cases, lavage in the morning before breakfast is usually sufficient: at this time any stagnating contents that may have remained in the stomach overnight has become decomposed and softened, so that it is easily removed with the stomach washings. At all events at this time any food material that may still be present in the stomach no longer possesses much nutritive value, so that it is best removed. It is, moreover, a precarious procedure to introduce fresh food into a stomach that contains fermenting and decomposed material from the previous day (see also page 388).

Lavage in the morning

Lavage in the afternoon

In some cases of gastric catarrh in which the motor power of the stomach is sufficiently good to cause the evacuation of all the stomach contents during the night, it may be better to perform lavage six or seven hours after the main midday meal, especially as these patients suffer the greatest distress and discomfort at such time. In this way much of the mucus is removed and the stomach is relieved of labor that it is manifestly unable to perform, for, normally, the stomach should be empty at this time. If the stomach contents is removed late in the afternoon, then the patient should receive a very light evening meal.

Lavage in the evening

In another variety of cases the patients complain of the greatest distress at night; this occurs particularly if the heaviest meal is eaten in the evening and the patients go to bed three or four hours after the dinner. Here distention of the stomach with gases [illegible] epigastric pain, awaken the patients in the night [illegible] with sleep and hence general [illegible]. In such cases it is best to perform lavage of the stomach just before the patients retire for the night.

[illegible] cases it may be necessary to perform lavage [illegible] hours after the main meal. [illegible]

Irrigation fluids

Alkalies

Salt

[illegible] water of body temperature [illegible] is advantageous to use [illegible] two teaspoonfuls of sodi-[illegible] of lime water to a [illegible] or a teaspoonful [illegible] salt and one part of sodium [illegible] in dissolving [illegible] that are formed by [illegible].

Antiseptics

Potassium permanganate

salicylic acid

thymol

hydrochloric acid

[illegible] wash water can do [illegible] permanganate, [illegible] 1 : 2000 [illegible] 1 : 1000 [illegible] 1 : 2000 hydrochloric acid [illegible] 1 : 1000.

The evacuation of the stomach mucus can be further aided by forcing the water into the stomach under considerable pressure, i. e., either by holding the funnel high above the mouth, or better still, by using the stomach tube and aspirating bulb and exercising considerable pressure upon the bulb when the water is forced into the stomach. Lavage should be continued until the wash water comes out quite clear. In some cases it will be necessary to wash the stomach out with the patient sitting erect and also lying down. In chronic gastritis, in which the patients soon become accustomed to the use of the stomach tube, there is no difficulty in keeping the tube in place while the patient changes his position.

Technique of lavage in chronic gastritis

There are distinct contra-indications to the use of the stomach tube, namely, advanced arterio-sclerosis, heart lesions in stages of pronounced decompensation, esophageal varices, aneurism, angina pectoris and great hyper-excitability or pronounced general debility of the patient. If any of the above named conditions exist, so that the use of lavage must be reluctantly abandoned, then mineral waters must take the place of gastric lavage.

Contra-indications to use of stomach tube

Mineral waters may, of course, also be used in combination with lavage in any subject. They act very much like lavage, with the difference that the mucus and the fermenting material that they dissolve is washed into the intestine instead of being removed by the mouth. The use of mineral waters is, therefore, by no means so valuable nor are the results from their employment to be compared with those obtained from washing out the stomach. If there is much motor insufficiency, the ingestion of abundant water is, moreover, distinctly contra-indicated. Much harm can be done from the routine use of so-called water cures.

Mineral waters

Part of the benefit accruing to stomach cases from the use of the various mineral waters must be attributed more to the life at the resorts in which these waters are taken than to any of the healing properties of the waters themselves; for sufferers from digestive disorders who go to a watering place lead a life of great regularity among pleasant surroundings, free from the worry and routine of their daily existence; they are careful in their diet and are, above all, under the supervision of physicians who are especially skilled in the treatment of this class of diseases.

Resort treatment

In many of the resorts routine regulations are given the patients in regard to their diet, and they are told, often on printed slips, what to eat and what not to eat during their water cure. Broadly speaking these restrictions are all theoretically constructed and no special dietetic restrictions need, as a rule, be observed when the different waters are taken that would not be

Dangers of routine in resorts

observed if no water cure were being instituted. The chief danger lies in the drinking of too much water and in drinking large quantities of water too rapidly, most patients imagining that if a little of the waters will do them good, a great deal must do them more good; and they are generally encouraged in this belief by the attendants and occasionally by the physicians in these resorts.

Alkaline waters

The chemical ingredients of the different waters determine their use in different conditions. Alkaline waters aid in dissolving the mucus, in combining the organic acids that are formed by fermentation in the stomach and by increasing intestinal peristalsis. They, as well as the alkaline saline waters, are especially useful in atonic and secondary catarrh of the stomach. Alkaline waters alone have their particular field of application in chronic hyper-acidity with catarrh.

Saline waters

Saline waters, which should never contain more than ten per cent. of sodium chloride, stimulate the formation of hydrochloric acid and of the digestive ferments, and also excite the motor power of the stomach and to some extent the appetite. They are especially useful, therefore, in cases with hypo-secretion and slight motor insufficiency.

Sulpho-saline waters

Waters containing Glauber salts, and sulphur waters, as well as the bitter waters, are useful, particularly when gastric catarrh is accompanied by obstinate constipation and abdominal plethora. As they are somewhat irritating to the stomach, their use is limited in gastric disorders.

Lime waters

Lime waters act like the alkaline waters, i. e., they are useful on account of their antacid and mucus dissolving properties.

Carbonated waters

The carbonic acid that many waters contain causes prompt belching of carbonic acid gas and this occasionally aids materially in the expulsion of fermentative gases that are accumulating in the stomach. The carbonic acid gas, moreover, acts as an anesthetic to the gastric mucosa in painful complications of the stomach, slightly stimulates the appetite and increases intestinal peristalsis. Carbonated waters should, of course, never be used in motor insufficiency and gastric atony, for here, precisely, distention of the stomach is to be avoided. The same applies to cardiac or respiratory diseases in which the stomach function is perverted, for here, too, distention of the stomach and bowel, by interfering with the respiratory excursions of the diaphragm, and hence by imposing more labor upon the right heart, is to be avoided.

Temperature of the waters

The following rule may be formulated in regard to the temperature at which these different mineral waters should be taken:

If there is some motor insufficiency with decreased secretion of gastric juice and a tendency to constipation, then the mineral waters should be taken cold. If the gastric and intestinal mucosa is very irritable, and if there is a tendency to diarrhea, then warm or hot mineral waters are more grateful to the patient and probably more useful.

Diet

No fixed directions can be given in regard to the diet in cases of chronic gastritis. In each case repeated analyses of the stomach function should be made and the diet arranged according to the secretory and motor powers of the stomach, as described in subsequent sections. At the same time, in view of the fact that chronic gastritis is usually a disorder of long duration, every endeavor should be put forward to maintain full nutrition of the patient by supplying sufficient calories in the food. In most cases of chronic gastritis the presence of mucus (which covers the gastric walls and becomes intimately mixed with the food, thus preventing to some extent the outpouring of gastric juice and its mixture with the food) as well as the reduction of the hydrochloric acid, will have to be considered. Hence the food should be finely divided, thoroughly masticated and insalivated in order to impose as little labor as possible upon the stomach digestion and to facilitate the prompt removal of the food onward into the intestine.

Proportion of carbohydrates, fats, proteid

The carbohydrates in the diet should preponderate, especially if there is any motor insufficiency; for they undergo digestion almost exclusively in the intestine. The same applies to fats and the latter should be supplied in the form of digestible varieties of fats, i. e., milk fat or vegetable oils. Enough proteid should be supplied in the form of digestible meats (see page 347) to meet the nitrogen requirements of the individual. In this way the gastric function will not be overtaxed and the stomach will be spared and enabled more readily to regain its normal tone than if it is continuously overloaded with food that it can only digest with difficulty or not at all.

THE USE AND ABUSE OF HYDROCHLORIC ACID.

Hydrochloric acid

The administration of hydrochloric acid as a routine measure in gastric disorders is being abandoned since more careful chemical examinations of the stomach contents are being universally made and treatment is governed accordingly. It is self-evident that the administration of hydrochloric acid is, to say the least, superfluous, if not directly harmful in cases of dyspepsia in which the stomach contents or the vomit show a reaction for free hydrochloric acid (congo paper or phloroglucin vanillin test). In cases in which free hydrochloric acid is absent and in which

Dangers of routine use of HCl

the total acidity of the stomach contents is greatly reduced, hydrochloric acid may, to advantage, be given, first, as an aid to the digestion of albumens in the stomach, i. e., in order to render peptic digestion possible; second, as an antizymotic, i. e., in order to stop abnormal fermentation in the stomach; third, as a stomachic, i. e., to stimulate the outpouring of gastric juice.

HCl to replace the deficit of HCl in the stomach

The administration of hydrochloric acid for the purpose of replacing the deficit of hydrochloric acid in the stomach is a substitution therapy. The effect of this treatment is greatly overestimated. The small doses of five or eight drops that are commonly given after eating are practically useless and hydrochloric acid, in order to be effective at all, must be given in very much larger doses. It has been shown by direct experimentation that one cannot give enough hydrochloric acid with an albuminous diet to cause the appearance of free hydrochloric acid in the stomach contents, unless such enormous doses are given that the patient would be poisoned. One part of hydrochloric acid saturates eighteen parts of albumen, and as a hundred drops of dilute hydrochloric acid contain only 0.8 gm. of HCl, this amount would only be sufficient to neutralize fifteen grammes of albumen.

Inadequacy of this treatment

In order to aid the peptic digestion of albumens, fifteen to twenty drops of dilute hydrochloric acid in about 100 cc. of water should be given immediately after eating, and the same dose repeated every hour thereafter for three or four doses; or the same dose may be given immediately after eating and every fifteen minutes thereafter for three or four doses. The introduction of such large quantities of water is, however, not without detriment. Some patients react to the administration of so much hydrochloric acid by gastric distress and pain, and unless the remedy is taken through a glass tube the teeth may be injured; all these disadvantages render the administration of hydrochloric acid as a substitute for the gastric hydrochloric acid a rather hazardous and by no means always an effective procedure.

Disadvantages of giving much HCl

Whereas, therefore, the administration of hydrochloric acid as a direct substitute for the deficient hydrochloric acid in the gastric contents is a procedure of doubtful efficacy, regarded from the purely chemical standpoint, we know, clinically, that the exhibition of much smaller doses than those required according to the above reasoning are occasionally useful in relieving dyspeptic symptoms. This may be due to the fact that hydrochloric acid stimulates the flow of gastric juice. This point, however, is still uncertain, for the cases in which an increased flow of gastric juice seemed to follow the administration of free hydrochloric acid are not without ambiguity. It is not impossi-

Effect of HCl on flow of gastric HCl

ble that the administration of some hydrochloric acid after eating acts as a rest cure, so to say, to the hydrochloric acid glands of the stomach by relieving them of some of the labor necessary to manufacture hydrochloric acid, and hence enables them to more readily regain their normal tone. Hydrochloric acid is also known to stimulate the pancreatic secretion and therefore it may aid intestinal digestion and, provided the motor power of the stomach is good, promote the vicarious disassimilation of the albumens in the bowel.

Action of HCl on intestinal digestion

HCl before meals

If it is desired to utilize the stimulating effect of hydrochloric acid upon the flow of gastric juice and upon the pancreatic secretion, the remedy should be given in doses of ten to twenty drops diluted with about 100 cc. of water, a quarter to half an hour *before* eating. Administered in this way its full stomachic effect becomes promptly manifest. The administration of hydrochloric acid in this manner is by far more rational and generally much more effective than the administration of larger doses during the meal or immediately afterwards. Hydrochloric acid administered in this way also stimulates the appetite.

HCl as an intestinal antiseptic

In some cases it appears moreover to increase peristalsis and to act, in a sense, as an intestinal antiseptic; so that it is particularly useful in the treatment of the diarrhea and fermentative intestinal dyspepsia that so often complicates chronic gastritis.

HCl as an antizymotic

Aside from its action as a digestant and as a stomachic, hydrochloric acid is also administered for the purpose of holding the pullulation of saccharophytes in the stomach in check. Fermentation due to various moulds, fungi and bacteria is particularly active in the stomach in cases in which the hydrochloric acid secretion is reduced and in which stagnation of stomach contents occurs. It is very questionable whether the administration even of large doses of hydrochloric acid can stop fully developed fermentation in the stomach; as a prophylactic, however, given before meals, the administration of hydrochloric acid is exceedingly useful; for by this practice we are imitating Nature's mode of preventing overgrowth of fermentative micro-organisms in the stomach. Here, too, then the administration of small doses of hydrochloric acid on an empty stomach is effective, whereas the administration of large doses during or after meals is of very little value.

DRUGS IN CHRONIC GASTRITIS.

Alkalies

Alkalies are frequently administered in cases of hypochlorhydria or gastric anacidity on the supposition that they act as stimulants to the flow of hydrochloric acid, especially if given before meals. It has been claimed that a reactive outpouring of hydrochloric acid occurs upon their administration which is intended to neutralize the alkali placed into the stomach. Experimental and clinical evidence, however, demonstrates this supposition to be wrong. It is true that in healthy subjects certain of the alkalies given on an empty stomach can cause some increased outpouring of gastric juice, but they share this property with any other drug that might be poured into an empty stomach and that irritates the gastric mucosa; but they do not fulfill this purpose so well as the bitters or stomachics to be presently discussed.

Alkalies before and after meals

The administration of alkalies before meals is, of course, an exceedingly useful procedure in gastric hypersecretion and hyperchlorhydria on account of the antacid action they exercise (see page 397), and the same antacid properties render them useful when administered after meals, not only in the hyperacidity that is due to an excessive outpouring of hydrochloric acid, but also in gastric acidity due to the formation of abnormal organic acids by fermentative micro-organisms. In the symptomatic treatment of chronic gastric catarrh they have a place, therefore, as neutralizers of organic acid and also of excessive hydrochloric acid in those rare cases of chronic gastric catarrh that are accompanied by hyperchlorhydria. Furthermore, alkalies are useful in dissolving the mucus in chronic gastric catarrh. Much better, however, than the administration of alkalies by swallowing either for the purpose of neutralizing organic acids or dissolving mucus is their introduction into the stomach by means of the stomach tube when lavage is performed (see above). As the formation of organic acids and stagnation of stomach contents does not occur, however, in gastric catarrh if proper lavage is instituted, and as the administration of alkalies after meals would neutralize small amounts of hydrochloric acid that are usually formed in chronic gastric catarrh, their utility as a medicine in this disease is very limited. Their employment in hypersecretion and hyperchlorhydria complicating gastric catarrh will be discussed in the section on these disorders.

Stomachics Bitters

Medicines belonging to the group of stomachics and simple bitters are very useful in chronic gastric catarrh. In most cases they increase the appetite, stimulate the flow of gastric juice and increase the motor power of the stomach. They are especially useful in cases of chronic gastritis accompanied by a reduction of hydrochloric acid, but they are distinctly contra-indicated in hyperchlorhydria of any kind. Whereas, from a pharmacologic standpoint two groups of remedies, viz.: stomachics and bitters, may, somewhat artificially, be distinguished, from a practical, i. e., clinical standpoint, this differentiation is altogether

Mode of action

superfluous. As a matter of fact, we know very little of the exact mode of action of the stomachics and bitters, and the literature is full of contradictory statements in regard to their efficacy. Some of the remedies of this group produce hyperemia of the gastric mucosa, others possibly exercise a directly stimulating effect upon the gastric glands. Inasmuch as all these remedies have a different composition and origin and are in no way related to one another chemically, but as they all have in common both their effect upon the appetite and digestion and their bitter taste, it seems reasonable to attribute their chief influence to the latter property. It is quite probable, especially in the light of Pawlow's recent researches, that they act on the gastric digestion and upon the appetite through nervous reflexes emanating from the mouth, i. e., by their taste, producing, like many other substances with pungent odors or strong tastes, a reflex secretion of gastric juice. Besides, a certain psychic effect resulting from the popular prejudice in favor of bitter remedies as efficient stomachics cannot be excluded.

Gentian
Quassia
Condurango
Nux vomica
Cinchona

The number of stomachics and bitters is very great, and it is a difficult matter to select from them. The most popular are the following: Gentian, given as the fluid extract in ten to thirty minims (0.7 to 2 cc.) or as the compound tincture of gentian in the dose of one-half to four drachms (2 to 16 cc.); quassia, as the tincture, fifteen to sixty minims (1 to 4 cc.) or the fluid extract, five to thirty minims (0.3 to 2 cc.); condurango, as the fluid extract, fifteen to twenty minims (1 to 1.3 cc.) or the wine of condurango, two to four drachms (8 to 16 cc.). In place of these simple bitters preparations of nux vomica, one to five minims (0.06 to 0.3 cc.) of the tincture; cinchona, as the tincture, one to four drachms (4 to 15 cc.) or the fluid extract of cinchona in one drachm (4 cc.) doses.

Cardamoms
Cinnamon
Anis
Nutmeg
Caraway
Bitter Almonds
Peppers
Mustard

Many drugs of the volatile oil series containing, in addition to the aromatic oils some bitter principle, are also used; for instance, the tinctures of cardamoms, cinnamon, anis, nutmeg, caraway, bitter almonds and many others in the form of spirits, waters, tinctures, fluid extracts or infusions, and, besides, certain of the peppers and mustard.

Orexine
Basic orexine

A very useful synthetic remedy that, in some instances, exercises a remarkably stimulating effect upon the appetite, is orexine. Orexine itself, if given in large doses, may cause a burning sensation along the esophagus and in the stomach, and, in susceptible subjects, nausea and vomiting. Basic orexine is the best preparation, as it is only slightly irritating to the stomach and, in nearly all cases, produces an increased flow of gastric juice, aids digestion and stimulates the appetite. Basic orexine should be given in capsule containing five grains (0.3 gm.) in the middle of the afternoon with a full glass of water or milk; or one can begin with a smaller dose of two grains (0.1 gm.) on the first day and increase it by a grain or two a day until a dose of five or six grains is reached. In either case the remedy should be taken only for four or five days; within this period good results are usually obtained. After the fourth or fifth day the further administration of the remedy is generally superfluous, especially as its effect wears off. It is often good practice to stop the administration of orexine for a week and then to resume the use of the medicine for four or five days again.

THE USE OF DIGESTIVE FERMENTS.

Digestive ferments

The administration of digestive ferments, pepsin, pancreatin, ptyalin, as well as of certain vegetable ferments with proteolytic or diastatic properties, is very popular. The utility of these products in dyspeptic disorders, is, however, highly problematic.

Pepsin

Pepsin is indicated on theoretical grounds where the secretion of pepsin by the gastric glands is deficient. This is a very rare event; for it will be found that even in those cases in which the hydrochloric acid secretion is very low, pepsin, or at least pepsinogen, is excreted and that the albumen digesting power of the gastric juice is small, not on account of the pepsin deficit, but for lack of hydrochloric acid. In an overwhelming majority of these cases the addition of hydrochloric acid to the gastric juice will promptly restore its proteolytic power, so that stimulation of the flow of hydrochloric acid or the administration of large quantities (see above) of hydrochloric acid is all that is required. The administration of pepsin, itself, is indicated, therefore, only in those cases in which the gastric contents, rendered acid with hydrochloric acid, fails to digest proteids. To administer pepsin when free hydrochloric acid is present in the stomach contents is altogether futile, for it has been shown that, when free hydrochloric acid is present, pepsin is always secreted in abundant quantities. In rare cases of achylia gastrica, in nervous anacidity and apepsia, in atrophy of the gastric glands and occasionally in gastric carcinoma pepsin may be of some value. In certain advanced cases of chronic gastric catarrh, in which the pepsin secretion is reduced on account of functional weakness of the peptic glands, the administration of pepsin in combination with hydrochloric acid may also aid to some extent both by actually furnishing pepsin and by relieving the peptic glands of the labor of secreting pepsin, hence sparing them and enabling them better to regain their normal function.

Preparations of pepsin

The popular wines and essences of pepsin are always weak and frequently possess no proteolytic power whatsoever; in fact, the alcohol they contain somewhat impairs the action of the pepsin. These remedies, besides, if given in large quantities, may injure the stomach. The official pepsin of the U. S. P., made from the glandular layer of pig's stomach, should be capable of digesting not less than three thousand times its weight of coagulated egg albumen. It is dispensed in powder form or as fine scales, either in capsules containing five to ten grains (0.3 to 0.6 gm.), or in a 0.2 per cent. hydrochloric acid solution, immediately after or during meals.

Papain
Bromelin
Cradin

Papain (papayotin or papoid), a product made from carica papaya, and bromelin made from pineapple and cradin from ficus carica, all possess considerable proteolytic powers.

The best of this group is papain, which does not digest proteids as energetically nor as rapidly as pepsin, but possesses this advantage over pepsin, that it digests albumen not only in an acid but also in a neutral or alkaline medium, so that it continues its effect after it has left the stomach.

Pancreatin

Pancreatin, a mixture of the enzymes of the pancreas, is administered in powder or capsule in the dose of two to five grains (0.1 to 0.3 gm.) only if the secretion of hydrochloric acid is reduced, or if hydrochloric acid is altogether absent from the stomach; for it does not act in an acid medium and is rapidly destroyed by the action of hydrochloric acid in the stomach. If some hydrochloric acid is present in the gastric juice, then this must be neutralized by administering sufficient soda with pancreatin. In this way pancreatic digestion is, so to say, transferred to the stomach. Inasmuch as the pancreatic secretion is rarely impaired in gastric disorders, it is much more rational to promote rapid propulsion of the stomach contents into the bowel, for there the food is at once exposed to the action of the normal pancreatic ferments. In cases of insufficiency of the pancreatic secretion in the bowel (a condition that it is almost impossible to diagnose), pancreatin might be given in gelatin capsules that withstand the hydrochloric acid of the stomach; or pancreon, a tannic acid precipitate of pancreas, may be administered, for this remedy resists the action of the gastric juice for four or five hours. It may be given in doses of five grains (0.3 gm.) in watery solution, during meals, if hydrochloric acid is absent, half an hour before meals if hydrochloric acid is present in the stomach. It will be seen, therefore, that in chronic gastric catarrh the use of pancreas preparations is very limited. Pancreas preparations as well as amylolytic, i. e., starch digesting fer-

Pancreon

Amylolytic ferments
Ptyalin
Diastase
Taka-diastase

ments as, for instance, ptyalin made from salivary glands, malt diastase (malt extract, maltzyme, maltine, etc.) takadiastase (from aspergillus oryza) are indicated only in gastric hyperacidity in combination with alkalies; hence they are practically never used in chronic gastric catarrh.

Treatment of special symptoms

With the introduction of systematic lavage, the judicious use of hydrochloric acid and stomachics, and the proper administration of a carefully selected diet to fit the state of the gastric function as determined by analysis of the stomach contents, the use of medicines for the treatment of special symptoms like nausea, vomiting, gastric pain, belching, meteorism, diarrhea and constipation has become practically needless. If the decomposing and fermenting contents and the offending mucus are removed at frequent intervals by lavage with alkaline waters, the formation of gases and of irritating acids in the stomach and their propulsion into the bowel is to a large extent prevented. Hydrochloric acid, judiciously administered, also in a measure impedes the formation of toxic bodies and aids in the proper disassimilation of the food, hence increases the appetite and the general nutrition. No occasion, therefore, under this treatment is given for the development of nausea, vomiting, belching, meteorism or diarrhea. The constipation, if persistent, should be combated chiefly by the ingestion of abundant fresh fruits and vegetables, by laxative mineral waters, occasionally by a little rhubarb and by enemata, but not by strong vegetable or mineral purgatives, as the latter may seriously injure the irritated and inflamed gastric mucosa and hence impede the healing process. Severe and persistent gastric pain can, as a rule, be effectually stopped by the application of Priessnitz compresses or of hot water bags to the epigastrium, so that the use of narcotics will rarely become necessary. Hyperchlorhydria complicating chronic gastritis and producing pain (a rare event) should be combated according to the principles discussed in full in another section.

Nausea
Vomiting
Pain
Belching
Meteorism
Constipation
Diarrhea

GASTRIC ULCER.

General indications

The healing of an ulcer of the stomach is, self evidently, accelerated if the stomach walls are kept in a quiet, contracted condition and if the surface of the ulcer is protected, so far as that is possible, from mechanical, thermic and chemical iritation. An ulcer of the stomach differs in this respect in no way from an ulcer located in any other part of the body; for anywhere healing is promoted by quiet of the adjacent parts, the avoidance of stretching and the protection of the surfaces of the ulcer from extraneous irritants.

In gastric ulcer certain difficulties inherent in the character of the ulcer, the peculiar anatomy of the stomach and the nature of its functions, are encountered that render the carrying out of this plan very difficult. Complete rest of the stomach wall and avoidance of distention, as well as protection of the ulcer surfaces, can only be procured by withholding all food for a time, and later by carefully administering liquid, soft, bland foods of moderate temperature; at the same time, the acidity of the stomach contents, which is usually increased in ulcer, must be reduced by appropriate feeding and medication; and the healing of the ulcer, so far as that is possible, stimulated by direct medication. Above all things, during this time every effort must be advanced to maintain the patient's general nutrition, as otherwise the organism becomes unfit to put forward its best efforts towards promoting regeneration and healing in the affected area.

Causal and prophylactic treatment

Inasmuch as ulcer of the stomach is presumably always produced by some mechanical agency, trauma, thrombosis, etc., affecting either a healthy subject or an individual suffering from anemia, chlorosis or circulatory disorders in the stomach wall, causal treatment is manifestly impossible. This is due to the fact that the injury that directly produces the ulcer cannot be anticipated nor forestalled, so that prophylaxis in the broader sense is out of the question.

Factors that impede healing and favor extension

We know, however, that the failure of gastric ulcer to heal as promptly as ulcers in other parts of the body, and its tendency to extend, must, in large part, be attributed to the hyperchlorhydria that usually accompanies gastric ulcer; we know further that anemia and chlorosis not only predispose to gastric ulcer, but impede its healing; hence in the presence of the gastric ulcer treatment should always be directed towards correcting gastric hyperacidity and any anemia or chlorosis that may exist, according to methods that are described in full in appropriate sections.

Complete abstinence from food

Complete abstinence from food for a period of time, fluctuating from a few days to several weeks according to the peculiar exigencies of the case, is always good practice. In most cases it is safe to resume the administration of some food after the fifth day, for equally good results are generally obtained from this course, provided the feeding is carefully instituted according to the principles to be presently discussed, as from total abstinence from food for a period of several weeks. The latter plan of treatment, which is now very popular, is, therefore, as a rule, unnecessarily severe, moreover very difficult to carry out on account of the unwillingness on the part of the patient to undergo such a

Feeding after fifth day

Disadvantages of rectal feeding

trying ordeal; above all, there is much difficulty in most cases to maintain adequate nutrition by rectal feeding (see below) alone. When one considers, furthermore, that rectal feeding undoubtedly stimulates gastric secretion to some extent (one of the factors one is precisely trying to avoid by withholding food by mouth), this plan of treatment seems particularly useless in most cases.

Indications for rectal feeding

In patients suffering from severe gastric pain and vomiting, and notably from repeated hemorrhage from the stomach, whenever food is administered, the total abstinence plan with rectal feeding may, however, have to be reluctantly instituted for long periods of time, i. e., until all these symptoms disappear, or until, especially in cases of persistent hemorrhage, the proper time arrives for surgical intervention (see below).

Rest in bed

Heat and cold to epigastrium

Exercise during convalescence

A patient with gastric ulcer should always be kept in bed for a period of at least two weeks, or preferably longer, particularly if there is a tendency to hemorrhage or if symptoms of peritoneal irritation or inflammation are present. In the latter event the application of an ice bag or of a Leiter coil to the epigastric region is a useful measure, otherwise Priessnitz compresses or hot poultices, or a hot water bag for several hours each day, are more grateful to the patient. While in bed all violent movements should be carefully avoided and the patient should not be allowed to get out of bed even for the purpose of emptying the bladder or rectum. During the third and fourth weeks of treatment the patient may be permitted to sit up for a little while each day, and later take short walks about the room, and still later out-of-doors. For several weeks after the ulcer symptoms have disappeared, it is always a good plan to instruct the patient to lie down for an hour after each meal.

Thirst

Rectal irrigation

During the period of total abstinence from food, the distressing sensation of thirst that so many complain of should be counteracted by frequently washing the mouth with cold water and allowing the patient to suck ice pills without swallowing the water. The demands of the organism for water should be fulfilled by rectal irrigation; i. e., from 250 to 500 cc. of normal salt solution containing eight to ten grammes of sodium chloride to the litre of water should be injected, lukewarm, into the rectum, several times a day. If it is desired to slightly stimulate the patient, a little brandy or white wine may be added to this water enema, or a little bouillon may be used on account of its stimulating effect.

Rectal feeding

In feeding a patient by the rectal route one should proceed as follows: Prior to the injection of the nutritive enema, the lower bowel should be carefully washed out with warm, soapy water. An hour later, or sooner if all the wash water has been expelled, the nutritive clysma should be injected by means of a soft rubber catheter and an irrigating bag elevated about three feet above the patient. The tube should be introduced as far as possible into the colon. The patient should lie on the left side with the right leg drawn up and the hips elevated by a pillow or two. After the clysma has been injected the patient should remain perfectly quiet, preferably in the same position, for about an hour. The temperature of the enema should approximate that of the body. If the patient is unable to hold the enema, or if the clysma produces too much irritation, an event that is especially apt to occur if peptones or albumoses are used, then ten to twenty drops of the tincture of opium may be added to the enema. The total amount of the clysma should not exceed 250 cc. Rectal feeding may be instituted in this way two or three times a day.

Nutritive enemata

Many nutritive enemata of different composition have been described, for nearly every author who has written on this subject has devised some new mixture. One of the best and simplest forms of nutritive enemata that answers all purposes if rectal feeding is to be instituted for a short time only, and this is usually the case, is the following:

250 cc. milk.
2 yolks of egg.
2 tablespoonfuls of claret.
A pinch of salt.

Addition of salt

The addition of salt to nutritive enemata is very important, for it has been shown conclusively that the addition of sodium chloride greatly aids in the absorption of the nutrient bodies contained in the enema. The action of the salt is probably attributable to its power to stimulate antiperistalsis and hence to cause food injected into the rectum or colon to be carried into the small intestine, where absorption is much more active than in the lower bowel.

Peptones and albumoses

Peptones and albumoses, i. e., predigested albumens, aside from irritating the bowel in many cases are not absorbed more rapidly than native albumen itself, hence theii addition to nutritive enemata, which is commonly recommerded, is usually superfluous. Nevertheless, the following clysma, recommended by Singer, is very popular and occasionally serves a useful purpose:

125 cc. of milk.
125 cc. of claret.
2 yolks of eggs.
A little salt.
A dessertspoonful of Witte's peptone.

Sugars

The different sugars are rapidly absorbed from the intestine, but as they easily undergo decomposition and lead to fermentative gas formation and distention of the bowel, their use cannot be particularly recommended. Of the various sugars that can be used dextrose is the most valuable, but its extensive employment is rendered impractical by its cost. A simple nutritive enema recommended by Ewald and containing dextrose is made as follows:

Ewald's nutritive enema

Two or three eggs are mixed with a tablespoonful of cold water. A little flour is boiled in half a cup of a twenty per cent. dextrose solution and allowed to cool. To this solution a wine glass full of claret is added, the egg solution stirred in and the mixture filled up with water to 250 cc.

Egg enema

When using eggs for a nutrient enema the bowels should be thoroughly cleansed about an hour or two later, as otherwise decomposition of the egg albumen in the rectum may occur and toxic putrefactive bodies that are highly irritating be formed.

Feeding after abstinence

After four or five days of total abstinence from food with rectal feeding, milk should be carefully administered by mouth, at first in small doses of two or three tablespoonfuls, boiled and cold. After a hemorrhage it is best to give still smaller quantities of iced milk every two or three hours, or every hour. If the milk causes vomiting, and especially if large curds form, an event that is not uncommon if raw milk is administered but is not so apt to happen if the milk is boiled, the addition of a little lime water or of soda, or the administration of tablespoonful doses of ice cold milk at frequent intervals may stop these symptoms and enable the patient to take the milk by mouth. The latter mode of administration is also efficacious in subjects who manifest a severe dislike to milk.

Milk

Exclusive milk feeding not practical

Exclusive milk feeding is never a feasible plan, for, in order to adequately nourish the patient with milk alone far too much liquid must be introduced, and if the patient is to be fed with small quantities of milk at a time the administration of milk would have to be practically continuous throughout the day; for this reason the addition of milk powder, 100 grammes to the litre of milk, or of one to two teaspoonfuls of condensed milk to the litre of milk, may be practised in order to increase the nutritive value of the milk. In order to afford variety, buttermilk, kephyr or kumyss may be tried, but it must be remembered that

Milk powder

Condensed milk

Buttermilk, kephyr, kumyss

Gruels

all these milk products contain less fat and sugar than milk, and are hence less nourishing. Within the first ten days after total abstinence from food a little tapioca, rice, wheat, barley or oatmeal flour may be boiled in milk and these gruels given in place of milk alone.

Meat jelly

Albumen water

Egg bouillon

Dextrose solution

A very useful, nutritious and non-irritating addition to the bill of fare during this period is meat jelly prepared, according to Fleiner, by boiling chicken or beef with a calf's foot for several hours with the addition of a little salt. The soup, cooked in this way, is cleared by stirring in an egg and heating to a boil, the fluid is strained off and on cooling coagulates to a jelly. Of this meat jelly a dessertspoonful may be given every few hours. During this period, too, albumen water, made by dissolving white of egg in salt water, or an egg stirred up in a little bouillon, may also be allowed. Twenty per cent. solutions of dextrose in milk or water are also permissible. Such a sugar solution is quite nutritious and also possesses some antacid properties that are beneficial.

Diet during second ten days

On this simple diet, usually reinforced by one or two rectal feedings a day, the patient remains for the first ten days. During the second ten days of the ulcer cure the amount of the gruels is gradually increased and some of the soft and digestible meats, like squab, chicken, calves' brains, scraped raw meat, also a little mashed potato, boiled rice, noodles or macaroni, tapioca, sago, a little boiled cauliflower or zwieback soaked in milk may be allowed.

Diet during third and fourth week

Later still, i. e., during the third and fourth week, a little roast beef, beef steak, poultry, some boiled fish, vegetable pureés made of green peas, beans, carrots, a little chopped spinach, asparagus tips, some scrambled eggs or an omelet, may be permitted.

Diet during convalescence

As a more liberal diet is resumed, particular care should be exercised to exclude all mechanically irritating foods, as certain cereals and vegetables containing husks, stems, pips, skins or stalks, as well as berries, on account of their seeds, hard bread crusts, etc. Very hot or very cold foods and drinks, spices, condiments, strong alcoholic beverages and coffee are best avoided. It is always safer to administer small meals at frequent intervals than two or three large meals a day, even for weeks after the ulcer has healed.

Carlsbad salts

A very useful measure, adopted almost as a routine in European clinics, is the administration of one or two teaspoonfuls of Carlsbad salts dissolved in 250 cc. of water every morning on an empty stomach. The chief ingredients of Carlsbad salts are sodium chloride, sodium carbonate and sodium sulphate, and it is difficult to explain the beneficial action derived from the use of this mixture. It is probable that it acts in several ways, by dissolving the mucus, by neutralizing the excessive acidity and as a laxative.

Reduction of hyperacidity

Antacids

The reduction of hyperacidity, which is a very important element in the treatment of gastric ulcer, will be discussed in full in a separate section (page 393f). In ulcer cases living on a diet consisting largely of milk and eggs, the hydrochloric acid of the gastric juice is partially neutralized by the latter, for the albumen they contain possesses slight antacid properties. The addition of an alkali, either a tablespoonful of lime water to each glass of milk, or soda or magnesia, enforces this effect.

A very popular method of treating hyperacidity in gastric ulcer is by means of the following mixture:

℞

Sodium carbonate,	
Burnt magnesia, of each,	100 parts
Sugar of milk,	150 parts

Carlsbad Salts

Atropine Belladonna

This mixture is procured in bulk and the patient adds half a teaspoonful to each glass of milk. Carlsbad water or Carlsbad salts may also be used as an antacid addition to the milk, or Carlsbad salts may be taken immediately after each meal. If there is hyperacidity occurring not only after eating, but also hyper-secretion, so that acid gastric juice is present when the stomach is empty, then it may become necessary to administer alkalies between meals. In very excessive degrees of hyperacidity that cannot be readily controlled by the administration of alkalies, the use of atropine or belladonna may be required. The former should be given hypodermically in the dose of one hundredth of a grain (0.6 mg.) once or twice a day, the latter as the extract of belladonna by mouth in capsule with an alkaline water in the dose of a quarter grain (0.01 gm.) three times a day.

Silver nitrate

Another remedy used as an antacid and credited, moreover, with healing properties in gastric ulcer, is silver nitrate. This drug seems to be of particular value if much pain is complained of when the stomach is empty and also in gastric hyperesthesia with abnormal sensitiveness to the introduction of food. As silver nitrate neutralizes hydrochloric acid by precipitating the latter in the form of silver chloride, it is said to possess some antacid power, but, considering the small amounts of the drug that can be introduced, this effect is insignificant and the good symptomatic results obtained from the use of silver nitrate in gastric ulcer must be attributed in large part to some influence exercised by the drug upon the sensory apparatus of the stomach that is not altogether understood.

Dose and administration

Silver nitrate is best given in a solution of the strength of one to one thousand in tablespoonful doses, three or four times a day on an empty stomach. If this concentration is well borne the strength of the solution may be gradually increased to one and one-half to one thousand, then to two to one thousand, and the patient kept on tablespoonful doses of the stronger solutions three times a day throughout the course of the disease, i. e., for a period of from four to six weeks. Slight nausea and diarrhea that occasionally make their appearance in the beginning of this treatment are generally negligible, as these symptoms usually disappear spontaneously within a few days, and without special interference. The bad taste that patients taking silver nitrate solutions sometimes complain of can best be counteracted by peppermint or eucalyptus lozenges.

Chloroform water

As an anesthetic chloroform water can also be used in gastric ulcer, either alone, in the dose of a tablespoonful every two or three hours, or in combination with bismuth in the following formula:

℞

Chloroform	1 gm.
Distilled water	150 cc.
Bismuth subnitrate	3 gm.

One to two teaspoonfuls every hour (Stepp).

Indifferent powders

A number of indifferent powders like bismuth subnitrate or carbonate, orthoform, talcum, chalk, etc., may be used to advantage in gastric ulcer, more on account of their mechanical effect than because of any medicinal properties they possess. These substances form a thin coating over the ulcer surface, thus protecting it from the irritating action of the food and the gastric juice; at the same time they act as hemostatics by forming a powder cake over the bleeding area; they also generally relieve the pain.

Bismuth subnitrate and carbonate

Bismuth subnitrate should be given in large doses of two or three drachms (8 to 12 gm.) suspended in about 100 cc. of water, on an empty stomach. If the ulcer can be localized, the patient, after swallowing this mixture, should occupy such a position that the ulcer is in the most dependent part of the stomach; i. e., if the ulcer is situated at the lesser curvature or on the posterior wall of the stomach, the patient should occupy the dorsal position with his hips elevated; if at the pyloric part, he should lie on the right side; if on the anterior wall, he should lie on his face or occupy the knee-chest position. The appropriate posture should be maintained for about fifteen minutes to one hour. If the exact localization of the ulcer is impossible, and this will be the rule, the patient should lie for fifteen minutes successively on his back, his stomach, his left and his right side; in other words, he should perform complete rotation of the body within the space of an hour.

Introduction of bismuth by tube

It is rarely necessary to introduce the remedy through a stomach tube; this procedure, in fact, is never without danger, especially in recent ulcer, in ulcer near the cardia or in ulcer with a tendency to hemorrhages. If it is decided, however, to give the bismuth by tube, the stomach should first be thoroughly washed out with slightly alkaline, lukewarm water and after the last of the wash water, which should be perfectly clear, has been pumped or siphoned out, two or three drachms (8 to 12 gm.) of bismuth subnitrate or carbonate, suspended in a 100 cc. of lukewarm water should be poured into the funnel and washed down with a small quantity of water. The stomach tube should be left in place for five to ten minutes, in order to give the bismuth time to settle, then the water may be siphoned off and the tube withdrawn; or the tube may be introduced a second time very carefully and the water drawn off in this way. The former procedure, however, is by far the more practical one of the two. Best of all and least disagreeable to the patient, is swallowing the bismuth mixture without the aid of the stomach tube.

The bismuth treatment should be given from the beginning, at first every day, then every second day and later every third day. The effects from this therapy are generally very favorable and untoward symptoms on the part of the stomach, or poisoning from the absorption of bismuth (stomatitis, etc.), even when the drug is given in much larger doses than those indicated above, are never witnessed.

Orthoform

Orthoform, as such, or in the form of its muriate, is as useful as bismuth subnitrate or carbonate; it should be given in doses of sixty to ninety grains (4 to 6 gm.) suspended in a 100 cc. of water in the same way as bismuth.

Talcum-Chalk Magnesia mixture

Bismuth salts and orthoform, especially if they are to be used in such large quantities, are quite expensive, and in private practice the following mixture, recommended by Pariser, may be advantageously used instead:

℞

Talcum	60 parts
Chalk	60 parts
Magnesia usta	15 parts

Of this preparation five drachms are mixed with water and administered in the same way as bismuth. The slight antacid and laxative properties of the magnesia, and the fact that the ingredients of this mixture do not blacken the stools, and hence do not conceal small hemorrhages like bismuth, render this mode of treatment quite useful.

Olive oil

Olive oil, too, may be used for its mechanical effect, especially in cases of gastric ulcer with pyloric spasm due to intragastric irritation, with resulting dilatation of the stomach, stagnation of the stomach contents, and, consequently, irritation of the ulcer surface. Fifty cubic centimeters of olive oil may be introduced three times a day, or a hundred and fifty cubic centimeters taken on an empty stomach in the morning. The oil may either be swallowed or administered through the stomach tube.

If the rest treatment, described above, the careful regulation of the diet after a period of total abstinence from food, antacid medication with alkalies or Carlsbad water and atropine, the silver nitrate, or the bismuth or orthoform treatment are instituted, other measures intended to relieve special symptoms, notably pain and vomiting, rarely become necessary.

Narcotics

Narcotics should be used very sparingly and only in severe cardialgia and gastric pain that does not yield to hot applications to the epigastrium, antacid medication and the proper diet or total abstinence. The fact must never be forgotten that opium and morphine, aside from causing constipation, which is detrimental, increase gastric secretion, and hence favor precisely the outpouring of hydrochloric acid which is in most instances producing the pain in gastric ulcer. Narcotics, therefore, while they deaden the sensibility of the gastric nerves, favor the cause that irritates them.

Hot and cold applications

In most instances one must experiment with the use of hot or cold applications, some patients experiencing greater relief from the application of heat in the form of a hot water bag, poultices or the thermophore (see index), others being relieved by cold applied in the form of the ice bag, the Leiter coil or Priessnitz compresses.

Hematemesis

Hematemesis always calls for active treatment. Broadly speaking a recent hemorrhage or a tendency to recurrent hemorrhages precludes the application of heat to the epigastrium; here cold applied to this region is always safer. Total abstinence from solid food should be insisted upon until all traces of blood, as determined by daily chemical tests, disappear from the stools. During this time the nutrition of the patient should be maintained chiefly by rectal feeding. The patient should remain completely at rest in bed. Some patients do very well if they swallow teaspoonful doses of ice cold water at frequent intervals.

Hemostatic drugs

Adrenalin chloride

Opium
Morphine

If possible one should get along without the use of hemostatic remedies, and an opportunity for spontaneous cessation of the hemorrhage should be given; i. e., an expectant plan, as far as hemostatic drugs are concerned, should be followed for twenty-four hours, and the patient, during this time, treated by rest, cold applications and abstinence from food. If it becomes necessary to employ an hemostatic, the best remedy of all is probably adrenalin chloride, administered in the dose of ten to twenty drops of a one to one thousand solution, repeated at intervals of half an hour to an hour until the bleeding stops. At the same time excessive vomiting should be controlled by the use of opium or morphine given hypodermically or by suppository. Subcutaneously, ergotine may be given in the following injection:

Ergotine

℞

Ergotine	2.5 gm.
Glycerine	5.0 cc.
Water	5.0 cc.

(Riegel)

Hydrastis

Lead acetate
Bismuth

Other remedies that are occasionally useful are the fluid extract of hydrastis, given in fifteen to sixty minim (1 to 4 cc.) doses, by mouth, or hydrastinine hydrochloride, in the dose of one-half to two grains (0.03 to 0.1 gm.) by mouth or hypodermically. Lead acetate, in the dose of one grain (0.06 gm.) every two hours, or large doses of bismuth, may also prove useful.

Gelatin

Gelatin sometimes stops hemorrhage; it is conveniently administered in the following combination:

℞

Gelatin	15.0 gm.
Sodium chloride	1.2 gm.
Water	200.00 cc.

Of this mixture 100 cc. are to be given at once and the balance within two or three hours. The use of gelatin must be considered an extreme measure that will rarely have to be resorted to; in very profuse hemorrhages, however, it occasionally proves efficacious as an emergency measure.

After treatment

The after treatment of hemorrhage from gastric ulcer with loss of much blood is the same as that described at length in the sections on *Hemoptysis* and *Secondary Anemia.* During the hemorrhage and for some days afterwards, the bowels should be kept locked by the use of opium suppositories. After the bleeding has stopped, soft evacuations of the bowel contents should be promoted by the use of frequent enemata of soapsuds and water, glycerine, or oil, in order to avoid straining efforts at stool.

Indications for surgical treatment

Ulcers of the stomach that persist or show a tendency to recurrence despite the adoption of all the measures outlined above, and in which there is much vomiting and pain, or occasionally a slight hemorrhage, with resulting mal-nutrition of the patient, may call for surgical intervention. Simple, uncomplicated ulcers, however, rarely fail to yield to proper medical treatment carried out for a sufficiently long time, so that surgery has its chief field of usefulness in the treatment of the sequelæ and complications of gastric ulcer rather than in the treatment of the ulcer itself.

Repeated hemorrhages

Repeated, severe hemorrhage may call for a laparotomy, ligation of the bleeding arteries or excision of the ulcer area. A single severe hemorrhage rarely calls for surgical intervention, as statistics show that cases recover from such a hemorrhage without an operation as well as with an operation; in fact, the mortality is slightly higher if a laparotomy is performed in such cases than if it is not performed.

Surgical treatment of perforation, adhesions and other sequelae of ulcer

Perforation of an ulcer with invasion of the peritoneum by stomach contents; cicatricial contractures about the pylorus or cardia causing stenosis; scar tissue forming in other regions of the stomach, causing hour-glass contraction or diverticulum formation; perigastric adhesions producing dangerous traction or pressure symptoms on adjacent organs; perigastric abscess, are all sequelæ and complications of gastric ulcer that, being mechanical in character, call for mechanical, i. e., surgical, relief.

Excision of ulcer or gastro-enterostomy

Whether the ulcer is to be excised (and it is well to remember that recent ulcers are not always easy to find, and that ulcers may be multiple and hence cannot all be excised) or whether a gastro-enterostomy is to be performed must depend upon the peculiarities discovered when the abdomen is opened. It is, as a rule, impossible to predict before the laparotomy just what operation shall be made. A discussion of the different operative procedures that can be adopted lies without the frame of this book.

CARCINOMA OF THE STOMACH.

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The main duty of the internist in the treatment of gastric carcinoma is to make the diagnosis as early as possible and then to order surgical intervention. In the case of this disease surgery is not a last resort, as in so many other disorders, to be tried only after the skill of the internist has been exhausted, but a first resort to be adopted as soon as the diagnosis is positively made, and the only resort that can bring about a cure of this affection. It is by all means a safe and conservative plan, and one that would save many lives if adopted more frequently, to perform an exploratory laparotomy in every case of organic stenosis of the pylorus, for no material harm is done in the hands of a skillful surgeon if the stricture after laparotomy should be found to be due to the presence of benign tissue; while if it should be found to be due to carcinomatous tissue, early resection may be life-saving. It is unfortunate, however, that carcinoma producing stenosis symptoms about the pylorus is usually already far advanced.

Resection of the tumor in most cases, therefore, is merely a palliative measure capable, often, of prolonging the patients' existence, but rarely of curing them. At best even complete resection of a gastric carcinoma leaves the patient with a stomach whose secretory and motor functions, owing to the atrophy of the gastric mucosa that almost invariably accompanies gastric carcinoma, remain permanently impaired.

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Resection of the carcinoma is the operation of choice if the tumor is located in the pyloric region, if it is freely movable, is not adherent to adjacent parts, if no metastases are present and if the general condition of the patient is good. These [illegible] are more or less theoretically restricted, especially in regard to the absence of metastases, for it is evident that small metastatic growths in the liver or the mesentery may very well escape detection.

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y

If metastases are found, or the tumor is adherent, or if it cannot be completely resected, if serious symptoms of stenosis about the pylorus with stagnation of gastric contents are present, then gastro-enterostomy becomes a useful palliative operation that often restores the patient to a condition of fair health and better nutrition for many months or even years, despite the presence of a carcinoma of the stomach. By producing an artificial passage from the stomach to the intestine, and thereby facilitating the passage of the food from the stomach into the bowel, stagnation of the gastric contents is prevented, digestion diverted altogether into the intestine and there vicariously carried on with more or less completeness, despite the atrophy of the gastric mucosa. At the same time the irritation of the gastric carcinoma by food and by irritating decomposition products that arise from food stagnation is prevented and hence its growth retarded.

Gastrostomy

In carcinoma involving the cardiac end of the stomach, provided dilatation of the cardia with bougies is not successful (and this measure only answers the purpose of keeping the cardia open temporarily) and in diffuse carcinomata of the stomach, the radical operation of gastrostomy must be thought of; for while the results of total extirpation of the stomach are not good and many early deaths have been reported from this operation, nevertheless, this procedure may constitute a palliative measure in extreme cases that may enable the patient to live in comparative comfort for several months afterwards.

Conditions under which internal treatment is indicated

If it has been determined that resection of the carcinoma is impossible; if the motor power of the stomach is so good that gastro-enterostomy appears a superfluous inroad; if the case is seen too late for a gastrostomy operation, in an advanced stage of cachexia or with metastases in various organs; if recurrences of gastric carcinoma appear after an operation and it does not seem feasible to operate a second time; or, finally, if a patient afflicted with cancer of the stomach refuses an operation, then a number of dietetic and medicinal means of treatment must be resorted to, all intended to maintain the general nutrition of the patient and to relieve a variety of distressing symptoms that may arise in the course of the disease.

Diet

The regulation of the diet in gastric carcinoma is one of the most important tasks of treatment. No set rules can be formulated as in the case of ulcer, and the selection of the diet must be governed chiefly by the state of the motor function and the peptic power of the stomach, as determined by frequent analyses of the stomach contents, as well as by the appetite, the particular likes and dislikes of the patient and his general state of nutrition. In most cases a fairly liberal diet is indicated. Every attempt should be made to allow the patient to enjoy his meals He should not, on the one hand, be forced to eat foods that he dislikes or that he knows do not agree with him even though such foods may be theoretically indicated, nor should he, on the other hand, be forbidden to eat articles that he craves and that he knows agree with him, unless they are absolutely harmful.

Liberal diet

Harmful foods

To the latter class of foods belong all articles that undergo rapid fermentation; they are bad because in most cases of car-

No fermenting foods

No indigestible particles

No large meals

cinoma of the stomach there is, early in the disease, a deficiency or a lack of (anti-fermentative) hydrochloric acid and reduced motor power; or if these conditions are not present in the beginning they are very apt to supervene sooner or later. In the second place, all articles of food that contain undigestible and mechanically irritating husks, stems, pips, seeds, tendons, cartilage, skin and connective tissue must be considered detrimental to cases of carcinoma of the stomach. In the same sense large meals should always be forbidden, because they overtax the failing motor and peptic powers of the stomach; consequently small meals at frequent intervals should be advised.

Aversion for meat

Most cases of carcinoma of the stomach instinctively have an aversion for meat; this is presumably a reflection in the appetite of the hydrochloric acid deficit. Meats should, therefore, be given sparingly and their administration never forced. Only soft and easily digestible varieties, like chicken, squab, calves' brains, sweet-breads, a little raw, scraped beef or rare steak or chop, fish, meat jelly should be given.

Vegetable albumens

Eggs

Milk

Gruels

Bread

Vegetables

Fruits

Fats

If meat is altogether distasteful, or if it is not well borne, albumen must be supplied by milk and vegetable albumens (neutrose, tropon) and eggs, the latter soft boiled, scrambled, poached or as omelet, not hard boiled or fried. Milk may be served as described under *Ulcer,* or it may be rendered more nutritious by strengthening it with condensed milk or milk powder; or it can be given in the form of gruels made of wheat, rice, oatmeal, barley, flour, or of arrow-root, sago, tapioca. Bread should be given in the form of old bread, toast, zwieback or crackers, never as hot bread. Of vegetables and fruits, cauliflower, asparagus tips, fruit sauces, stewed fruits are permissible. Fats should be supplied not as animal fat but as vegetable or milk fat in the form of olive oil or mayonnaise on salad dressings, butter, cream or cocoa. There is a popular prejudice against the administration of fat in cases of carcinoma of the stomach, but it will usually be found that these patients can tolerate considerable quantities of fat without digestive disturbances.

Beverages

Amount of liquid

The amount of liquid that should be introduced depends upon the motor power of the stomach. If there is much stenosis with gastric dilatation and stagnation of stomach contents, then the amount of liquids should be restricted and whatever beverages are administered should be given in small quantities. In extreme cases the ingestion of fluid by mouth should be restricted to the minimum compatible with comfort, and the water demands of the organism supplied by rectal irrigation as described elsewhere.

Dilute alcoholic liquors

In many cases dilute alcoholic liquors can do no harm. In pronounced motor insufficiency, however, they are detrimental, because the alcohol attracts water into the stomach.

Hydrochloric acid and digestive ferments

The administration of hydrochloric acid and digestive ferments to replace the deficient hydrochloric acid and pepsin in the stomach is of doubtful utility. As discussed in full in the Section on Gastritis, hydrochloric acid unless given in very large quantities does not aid materially in the digestion of albumen. If it is used at all, therefore, it should be given in ten to twenty drop doses in a 100 cc. of water, immediately after eating, and in the same dose three or four times afterwards at hour intervals. The advantages that might possibly accrue from the administration of the hydrochloric acid would, in cases of gastric carcinoma with motor insufficiency, be more than neutralized by the ingestion of abundant quantities of water that must be given with such large quantities of hydrochloric acid. Small quantities of hydrochloric acid are of very little value as a digestant unless we agree to attribute certain stomachic properties to the remedy administered in this way. If given as a stomachic, the drug is more useful when administered on an empty stomach half an hour or an hour before eating. If the motor power of the stomach is good, the administration of hydrochloric acid, and particularly of the ferments, is altogether superfluous, as the digestion of the albumens can be fully carried out vicariously in the intestine. If on the other hand there is much stagnation of stomach contents on account of motor insufficiency, then the small quantities of pepsin or pancreatin or papaya preparation, that might be added to the fermenting gastric contents, will not be efficacious.

Stomachics

If it is desired to administer a stomachic, any one of the remedies discussed on page 362 may be given either alone or in combination with small doses of hydrochloric acid before each meal. The best stomachic of all, however, is removal of the stagnating stomach contents by lavage. The indication for lavage is impaired motility of the stomach; so that in any case of carcinoma of the stomach, in which food is found after the normal period of digestion is over, methodic lavage should be instituted; in other words, if six or seven hours after a test dinner, or two hours after a test breakfast, coarse particles of food are found in the stomach contents, or, above all, if the stomach after a late supper preceded by lavage, contains food particles on the next morning, then washing out the stomach contents is indicated. Unless the motor power of the stomach is impaired, however, lavage of the stomach is altogether superfluous, even

Lavage

Lavage superfluous if motor power of stomach good

if it is found by analysis of the stomach contents that the peptic power of the organ is greatly reduced.

Time of performing lavage in impaired motor power

In severe degrees of motor insufficiency, i. e., in those cases in which undigested food particles are found in the stomach in the morning, lavage should be performed early in the day and before the first meal is taken. If the patient cannot sleep on account of the gastric distention, belching, pain or vomiting, that result from stagnation of the stomach contents, then lavage should again be performed immediately before retiring. In the milder forms of motor insufficiency, lavage is best done before the evening meal, for, in this way, the residue remaining in the stomach from the midday meal, and possibly from the morning meal, is removed and the supper goes into a clean and empty stomach, so that the evening meal can either be properly digested or can be propelled into the bowel in time without producing nocturnal distress.

Lavage of the stomach in carcinoma should be continued for a long time, best of all, throughout the course of the disease or until a gastro-enterostomy is performed or possibly until ulceration of a pyloric carcinoma occurs whereby a free passage from the stomach into the bowel may become re-established.

Lavage with medicated irrigations

Lavage performed before breakfast or before supper may be combined with the injection of stomachics into the stomach; or the wash water may be medicated with antiseptics like salicylic acid, boric acid, etc. (see page 356). The addition of these remedies to the wash water is, however, rarely necessary and, in most cases, altogether superfluous.

Symptomatic treatment

In most cases of carcinoma of the stomach, if the proper diet is administered and lavage of the stomach is methodically instituted special medicamentous treatment for the relief of symptoms is, as a rule, not required.

Vomiting

Vomiting of large quantities of stagnating food material is effectually prevented by lavage, especially if the wash water is medicated with antifermentative remedies (see page 356). If the vomiting is due to gastric hyperesthesia, cocaine administered as described on page 19, or chloroform water in teaspoonful doses frequently repeated, may be used. Narcotics are rarely indicated, and if they are given at all they should be administered by rectum in suppository or enema, or hypodermically. The one serious objection to the use of opiates is their tendency to produce constipation. If the vomiting is persistent and does not yield to lavage and to a simple diet and the above named measures, then the stomach may have to be put at rest for a number of days by total abstinence from food, and nutrition maintained by rectal feeding.

Hematemesis Bleeding from the stomach is rarely severe in gastric carcinoma; it should be treated by administering a bland, non-irritating diet and by employing all those measures and remedies that have been described at length in the Section on *Ulcer*, on page 376. The best remedy of all to stop oozing in ulcerating gastric carcinoma is adrenalin chloride administered in ten to twenty drop doses of a 1:1000 solution, at one hour or two hour intervals. In severe cases that are particularly intractable, or in cases of ulceration by carcinoma, in which the ulcer erodes a large blood vessel, total abstinence from food must be insisted upon and the patient fed by rectum. Opiates are occasionally indicated, especially if there is much stenosis about the pylorus with violent peristaltic movements on the part of the stomach; for opium possesses the power of reducing or stopping this peristalsis; its administration, therefore, in these cases aids in establishing quiet and contraction of the walls of the stomach. Externally cold should be applied to the epigastrium either in the form of an ice poultice, an ice bag or repeated cold cloths. Hot applications are contra-indicated if there is much gastric hemorrhage.

Pain The pain in carcinoma is usually relieved by the application of heat to the epigastrium either in the form of hot poultices, hot cloths, a Leiter coil through which hot water flows, a thermophore (see index) or Priessnitz compresses. If the pain appears only when the stomach is full, lavage, i. e., removal of the irritating stomach contents, brings about relief. Symptomatically the pain may be treated by the administration of cocaine (see page 19), by chloroform given in three to five drop doses on ice, and if there are signs of peritonitic irritation, by opium with atropine, administered hypodermically, by clysma or in suppository.

Constipation The constipation in gastric carcinoma is best treated by enemas of soap and water, glycerin and water, or oil. Laxatives are rarely necessary; if any are employed, simple vegetable remedies like rhubarb or cascara may be given in the form of the compound rhubarb pill containing rhubarb, aloes and myrrh and peppermint oil in the dose of four to eight grains, or as the fluid extract of cascara in half to one teaspoonful doses in water. Mercurial purges, drastics or salines should not be administered.

Diarrhea Diarrhea in carcinoma of the stomach is usually due to the entrance of fermenting and decomposing stomach contents into the intestine. This fermentative form of diarrhea can generally be prevented by methodic lavage instituted to remove the stomach contents before it undergoes decomposition and enters the intestine. If this measure is not carried out, then the intestinal antiseptics that are discussed in full in the Section on *Intestinal Catarrh* are of use. Very severe diarrheas, finally, may have to be combated by the use of opiates.

MOTOR INSUFFICIENCY OF THE STOMACH. (GASTRIC DILATATION, GASTRIC ECTASY, GASTRIC ATONY.)

Definition

The term *motor insufficiency* is employed to indicate that the stomach cannot get rid of food within the normal time limit. This condition may be due to a reduction of the normal propulsive power of the stomach wall, or to the presence of an obstacle at the pyloric orifice, or it may be due to an abnormally large amount of work imposed upon an otherwise normal gastric musculature. Motor insufficiency, then, primarily designates a perversion of function which may or may not be accompanied by changes in the size of the organ; for there may be motor insufficiency when the stomach is still normal in size but the pylorus is stenósed, or even when, as in some forms of gastric carcinoma and in cirrhosis of the stomach wall, the stomach is abnormally small.

Motor insufficiency

Gastric ectasy and dilatation

The terms *gastric dilatation* and *gastric ectasy* should be reserved for those cases of enlarged stomach in which there is motor insufficiency. Simple enlargement of the stomach without impairment of its motor power is designated as *megalogastria*.

Megalogastria

Gastric atony

Gastric atony means muscular weakness of the gastric walls. Wherever there is atony there is also muscular insufficiency and, as a rule, but not invariably, gastric dilatation (gastric ectasy). Gastric ectasy with atony of the stomach wall is called atonic ectasy. There is also a form of *hypertonic ectasy* in which the stomach is large and in which there is motor insufficiency, but in which the muscularis is hypertrophic and not atonic. This form of hypertonic ectasy occurs particularly in cases of stenosis about the pylorus in which the muscles of the stomach wall are submitted to persistent overwork. Sooner or later this form, too, develops into atonic gastric ectasy, especially if the obstacle about the pylorus is not removed. It will be seen, therefore, that gastric atony and gastric dilatation are closely related and that the latter may develop from the former. They have this in common that both are accompanied by motor insufficiency.

Atonic and hypertonic gastrectasy

Clinical differentiation

For ordinary clinical purposes, the finer anatomic differentiation between motor insufficiency with ectasy or atony is superfluous and the following practical method of differentiation suffices for therapeutic purposes:

The stomach is atonic if it requires an abnormally long time to expel the food, but, nevertheless succeeds in getting rid of all or nearly all of its contents during this abnormally long period. As a result little occasion is given for stagnation of the stomach contents and for its fermentative decomposition. A simple atonic stomach should always be empty in the morning. In atony the stomach is only slightly enlarged if at all and its lower boundary should not extend further than the umbilicus when it is filled (e. g., with a 1,000 cc. of water). The stomach is dilated (gastric ectasy) if it always contains food particles in the morning and if its lower boundary extends below the umbilicus; here stagnation of stomach contents and fermentative decomposition are the rule.

Inasmuch as gastric ectasy frequently results from and follows atony, it is clear that intermediary stages between simple atony and atony with dilatation must needs be encountered.

Congenital, acquired atony

Gastric atony is often congenital. In most cases, however, it is acquired and constitutes a part phenomenon of general muscular asthenia; thus gastric atony is encountered in many chronic cachectic states, after severe infectious diseases, in many disorders of the liver, the heart and the kidneys, occasionally in chlorosis and anemia, after mental or bodily exertion and sexual excesses, after poisoning with alcohol and tobacco and in a variety of functional and organic diseases of the central nervous system.

Causes of dilatation

Dilatation of the stomach, on the other hand, may, as mentioned above, develop from simple atony of the stomach superinduced by any of the above causes, especially in cases that despite the weakness of the stomach walls, persist in over-eating and over-drinking. In most instances, however, gastric ectasy is due to the presence of some mechanical obstacle to the passage of food in the pylorus or upper duodenum, as for instance, carcinoma, cicatricial constriction following ulcer or erosion, pyloric spasm with or without hypertrophy of the pyloric musculature from different causes (see page 408), constriction or obturation of the pylorus by adhesions in the neighborhood or from compression from without by tumors, gall stones, etc.

Causal treatment

It will be seen from all that has been said that the causal treatment of motor insufficiency of the stomach with or without gastric atony or dilatation must take all these manifold factors into careful consideration. In many instances the primary cause cannot be removed or can be made to disappear only very slowly. In other cases the primary cause may be removed, but the motor insufficiency, i. e., the weak condition of the muscles of the stomach and enlargement of the organ persist. In all these cases active treatment directed towards improving the motor power of the stomach; towards preventing further dilatation and stagnation of the stomach contents; above all, towards maintaining the patient's general nutrition, despite the existence of gastric ectasy, must be energetically instituted.

Diet

General considerations

The diet in all these cases should be of such a character, first, that it imposes the minimum of labor on the stomach whose motor power is impaired; second, that it can be propelled easily and rapidly into the intestine; third, that it contains none of the articles that can undergo ready gaseous or acid decomposition in the stomach when they stagnate there; fourth, that it is sufficiently nutritious to sustain the patient. In selecting the proper diet the state of the gastric secretion must be taken into consideration in addition to the degree of motor insufficiency. The composition of the food will, therefore, have to vary according to the presence or absence of sufficient or over-abundant hydrochloric acid and peptic ferments.

Diet with normal or increased H Cl

If the secretion of hydrochloric acid is normal or increased, then there is no objection to the use of meats and other albuminous foods, inasmuch as these are promptly digested in the stomach; at the same time, especially in hyperchlorhydria, the ingestion of amylaceous foods should be reduced; for the digestion of the latter is always impeded in hyperchlorhydria, so that they are apt to undergo abnormal decomposition when they remain in the stomach in an undigested state for an abnormally long time.

Diet with Reduced H Cl

If the secretion of gastric juice is reduced no meats at all should be given, but eggs, milk and mushy, amylaceous foods, i. e., gruels, made of milk with wheat flour, rice, barley, tapioca or sago, milk toast, vegetable purées, fruit sauces, butter, cream and olive oil may be administered.

No large meals

Large meals should always be avoided and all of the articles enumerated above should be given in small quantities at frequent intervals. The amount of food and its consistency depend in one important group of cases upon the degree of stenosis at the pylorus, and one may say axiomatically that the greater the obstacle to the passage of food through the pylorus the smaller should be the quantity of food that is administered at a time and the softer its consistency.

From a practical standpoint it is best to experiment somewhat in each case, i. e., to determine at frequent intervals by actual removal of the stomach contents after a mixed meal, which foods of the different kinds are retained and which are evacuated from the stomach within the normal time limits. In combination with such a motility test a study of the state of the gastric secretion may advantageously be made and the selection of the diet somewhat regulated accordingly.

Motility test as an index for feeding

No coarse foods

All articles of food that are coarse in texture, that contain indigestible parts like tendons, skin, connective tissue, in the case of meats; stems, husks, skins, pips, seeds, in the case of vegetables and fruits, should be altogether forbidden. Carbonated beverages that distend the stomach are always bad. Alcoholic liquors, solutions of albumoses and peptones, very salt foods, very sweet foods and sugar solutions are forbidden, because they all draw water into the stomach and hence over-burden the organ.

Carbonated and alcoholic liquors to be avoided

Reduction of liquid intake

The total liquid intake should be somewhat reduced. A dry diet is not, however, advantageous, the claims of certain clinicians to the contrary notwithstanding, for the propulsion of semi-liquid and mushy foods is always easier in motor insufficiency than the propulsion of a dry stomach contents. There is, therefore, no objection to the introduction of small quantities of fluid with the meals nor to the administration of a liquid diet administered in reasonably small quantities, provided the liquids administered are nutritious, i. e., consist of milk, albumen solutions, strong soups, for the latter are propelled from the stomach as easily as mushy foods and more easily than solid foods of equal nutritive value. Too great restriction of the liquid intake may lead to a dehydration of the tissues manifesting itself by a strong sensation of thirst and theoretically, at least, in severe degrees of motor insufficiency by tetany.

Danger of tetany

Excessive dehydration resulting from great liquid restriction that may be necessary in some cases must be forestalled therefore by the administration of fluids by rectum, as described elsewhere, and this procedure is always indicated when the total liquid intake is reduced below 1,000 cc. in the twenty-four hours. In very advanced stages of gastric ectasy with serious stenosis, the ingestion of liquids may have to be reduced even below this minimum and in such cases rectal administration of liquids will have to be instituted several times a day.

Administration of fluids by rectum

Occasional total food abstinence

Occasionally total abstinence from food for a few days greatly aids in restoring some tone to the stomach; for when the gastric walls are spared all labor one may assume that the mucularis recuperates under this rest treatment. In such cases the patient may be fed for a number of days to great advantages by rectum alone. Rectal feeding, too, has a place in many cases to supplement the insufficient food administration by mouth.

Rectal feeding

In cases of gastric ectasy that are being prepared for operation, rectal feeding too may be instituted for several days preceding the operation.

Rest after meals

Rest after meals is a very essential element of the treatment. If the patient lies down after each feeding a larger proportion of blood determines towards the digestive tract than if the patient moves about; for, in the latter case much of the blood is drawn to the periphery, so that digestion may be somewhat impeded thereby. At the same time the erect position, especially when combined with active exercise, determines dragging and distention of the stomach when it is full of food and heavy, and, in this way, favors the further development of atony and dilatation. It is best to advise such patients to lie down for half an hour or an hour after each meal, preferably on the right side, as this facilitates the movements of the food toward the bowel. If there is an ulcer at the pylorus and much dilatation of the stomach, the latter position may, however, be hard to maintain on account of the pain and distress produced by the pressure of the food on the ulcerated area. In such cases the dorsal position is preferable. The evening meal should never be eaten too near bedtime, as digestion is less active during sleep and hence food may remain abnormally long in the stomach during the night.

Position to be occupied when lying down

Lavage

Lavage of the stomach should be instituted in all cases of motor insufficiency according to the principles enunciated in a preceding section (see page 355). In simple atony without ectasy and with mild degrees of motor insufficiency, lavage may occasionally be dispensed with. In gastric ectasy due either to atony or stenosis, lavage, however, is of the greatest value. By instituting methodic lavage an attempt is made to re-establish physiological conditions; this applies in particular to those cases of motor insufficiency in which food is still present in the stomach in the morning; for normally the stomach should always be empty at this time and it should enjoy several hours of rest during the night. In order to promote this object the evening meal should be taken, as stated above, several hours before retiring, preceded by a lavage; for, in this way any residue that may have accumulated from breakfast or dinner will be removed and the supper, which should be light, is introduced into a clean stomach containing no fermenting food particles. Such a supper should be digested within three or four hours. If it is found that the stomach contains food particles in the morning, even when this plan is adopted, or if the patient suffers much distress at night from distention of the stomach with gases, then it may be necessary to perform lavage before going to bed. In still other cases

Time for performing lavage

in which only very little residue is found in the morning, the stomach may be washed out before breakfast and again before supper. In most cases the afternoon lavage, six or seven hours after the heaviest meal, is sufficient.

Medicated lavage

Lavage of the stomach should be very thorough and should be performed both with the patient sitting up and lying down. Washing the stomach with anti-fermentative solutions like a three per cent. boric acid solution; two pro mille salicylic acid solution; two per cent. resorcin solution; two pro mille hydrochloric acid, and other drugs, is occasionally useful. The objection advanced against frequent lavage, viz: that nutritious material is thereby removed from the stomach, is more than overbalanced by the advantages accruing to gastric digestion from the removal of stagnating particles and the introduction of new pabulum into a clean, empty stomach.

Douching

In combination with the morning lavage, douching of the stomach may be instituted. This consists in forcing through a stomach tube containing numerous small openings, water, of eighty to ninety degrees Fahrenheit, under considerable pressure. Water injected into the stomach in this way hardly reaches all parts thereof, but the temperature of the water seems to exercise a tonic effect upon the weakened gastric musculature. This method of treatment is applicable chiefly to cases of gastric atony without much dilatation; but in gastric ectasy the injection of much water into the stomach under pressure is not good. The addition of medicaments to the douche water is hardly necessary. Stomachics added to the douche (see page 362) if the secretion of gastric juice is reduced and the appetite is impaired, can do no harm. If the hydrochloric acid is low sodium chloride in the proportion of ten grammes to the litre may be used. If there is hyperchlorhydria, a silver nitrate solution of the strength of 1:1000 is useful.

Addition of drugs to douche

In order to lend support to the stomach, especially in cases in which the abdominal parieties are relaxed, and in general gastro- and entero-ptosis combined with gastric ectasy, bandaging the abdomen is of some value. Abdominal supporters and bandages hold up the abdominal contents and thereby support the stomach; dragging and tugging on ligaments is prevented and consequently various reflex irritations that may react unfavorably upon the tone of the stomach walls eliminated. An abdominal supporter in order to do any good at all should fit correctly. Some cases of gastric dilatation cannot bear abdominal binders on account of the pressure they exercise upon the stomach, especially when it is full or distended with gas.

Bandaging the abdomen

Electricity

To stimulate the tone of the atonic gastric musculature, electricity applied in different ways has been used. Personally, I have abandoned its employment, as its administration, especially by the intra-gastric method, is rather complicated and usually disagreeable, and because nothing can be accomplished by the means of electric treatment that cannot be brought about equally well or better by other simpler means. In advanced stenosis of the pylorus, moreover, in which the gastric wall is not atonic, it is not good practice to over-stimulate the gastric musculature; for the latter is already working to the limits of its powers, as manifested often by the appearance of visible peristaltic waves in the region of the stomach.

Technique of electro-therapeutics

Either the faradic or galvanic current may be used. Static electricity is rarely employed. The faradic or galvanic current may be applied either by the percutaneous (extra-gastric) method or by the intra-gastric method. If the motor power of the stomach is to be stimulated a faradic current applied percutaneously is the best. It should be applied by means of two large sponge electrodes, one of which is laid directly over the stomach, the other one about an inch removed from the right edge of the first electrode along the right side of the body. The current should be strong enough to produce muscular twitchings of the abdominal muscles but only very slight pain. The faradic current should not be applied in this way for longer than ten minutes. For the relief of sensory symptoms the galvanic current applied by the intra-gastric method is the most effective. A great variety of gastric electrodes have been described. The simplest one is a spiral wire with a knob at the end which can be pushed through an ordinary stomach tube. Before applying galvanic electricity by the intra-gastric method, the stomach should be filled about one-half with water in order to prevent burning of its walls by direct contact with the electrode. The anode should be connected with the intra-gastric electrode, the cathode with a large plate electrode which should be applied over the sternum or to the back. A weak current should be used and the treatment should not last longer than ten minutes. If the intra-ventricular treatments cannot be carried out, then either the galvanic or faradic current may be utilized for the relief of sensory symptoms by applying one large electrode connected with the anode over the epigastrium, another one connected with the cathode over the back or sternum.

Massage of the stomach

In skillful hands massage of the stomach is of some use; this measure, however, is, as a rule, superfluous. It is expected to fulfill two objects, namely, to strengthen the musculature of the stomach and to propel the gastric contents onward; the former object, owing to the inaccessibility of the stomach is probably very difficult to attain and therefore the value of massage in this direction is highly problematical. The latter effect is, at best, merely palliative and is, self-evidently, altogether fictitious and, at best, transitory, unless carried out immediately after each meal. There are, moreover, definite contra-indications to the use of gastric massage, notably the presence of an ulcer, the occurrence of a recent hemorrhage and perigastric adhesions.

Hydrotherapy

Of general hydrotherapeutic measures the Scottish douche, i. e., the application of a strong stream of water, the temperature of which is changed every twenty or thirty seconds from hot to cold, is the most useful. Fan douches, too, are of some value. Priessnitz compresses in many cases exercise a soothing effect and slightly stimulate contractions of the gastric muscles.

Medicamentous treatment

Nux vomica

Of drugs that are used to improve the tone of the gastric muscles, tincture of nux vomica or strychnia are the most popular. Tincture or extract of nux vomica should be given by mouth before meals or in the morning on an empty stomach with the stomach douche (see page 363). Strychnine is best given hypodermically.

Constipation and vomiting should be treated by the use of enemata, mild vegetable laxatives like rhubarb and cascara, and by abdominal massage (see index); mineral waters are, of course, to be eschewed.

Constipation
Vomiting

Vomiting generally yields to the proper regulation of the diet and to lavage. Priessnitz compresses or hot poultices to the epigastrium are frequently of value and if the vomiting is due to hyperesthesia of the gastric mucosa, cocaine (see page 19) or narcotics administered in suppositories or hypodermically may be used.

Oil cure

A useful procedure finally, especially in pyloric spasm with resulting stenosis and motor insufficiency, is the so-called oil cure. It consists in the administration of 50 cc. of oil three times a day, half an hour before eating, or of 150 cc. of olive oil on an empty stomach in the morning, either swallowed or administered through a stomach tube. This latter treatment frequently stops the spasmodic closure of the pylorus, facilitates the passage of the gastric contents into the bowel, exercises a slight laxative action which effectually counteracts any tendency to constipation and, at the same time, aids in nourishing the patient.

Surgical treatment

Surgical treatment often becomes necessary in advanced degrees of motor insufficiency. It may consist either in removal of the obstruction at the pylorus, in drainage of the stomach by gastro-enterostomy, in mechanical reduction in the size of the stomach or in producing mechanical changes in the size or the position of the stomach.

Indications for surgery

The indications for surgical intervention are the following:

First, the discovery of some mechanical obstruction to the passage of the food from the stomach into the intestine, especially if this obstruction remains persistent for a long period of time or if it increases, or if it is due to a malignant growth.

Second, if the motor insufficiency, atony and ectasy grow worse instead of better, despite the treatment outlined above.

Third, if despite all treatment and the apparently successcul relief of symptoms, including the motor insufficiency, the nutrition of the patient becomes impaired and weight is lost.

Fourth, if the patient does well under continuous treatment, but grows worse as soon as persistent treatment is stopped. In such cases, especially if the physician is convinced that the patient could not improve unless treatment were continuously carried out, an operation may become necessary.

Surgical methods

The methods of removing pyloric obstruction by resection, pyloroplasty, etc., need not be discussed in this volume. The indications for resection of the pylorus in carcinoma have been formulated on page 378. In many cases, especially those in which the motor insufficiency and dilatation are far advanced, gastro-enterostomy is, by all means, the best operation; for in some cases even the re-establishment of a patency of pylorus would not restore the motor tone to the stomach. Sewing tucks into the stomach is a useful procedure only in mild degrees of atony in which the stomach muscles still retain some contracting and propelling power. Gastroplication, shortening of the gastric-hepatic omentum, or of the gastric-hepatic and gastric-splenic ligaments, or fixing the stomach in a position where drainage through the pylorus becomes better, either by stitching or by making a sling of the lesser omentum sewed to the pancreas for the stomach to rest on, are methods of surgical treatment that have all been tried. All of the latter are applicable only to cases of motor insufficiency with dilatation due to atony, not to dilatation due to stenosis about the pylorus. It is altogether too early to pass definite judgment on the efficacy of these different, rather complicated, surgical procedures.

GASTRIC HYPERSECRETION AND HYPERCHLORHYDRIA.

Definition

These two conditions may be discussed together although they occasionally produce somewhat different symptoms and may call for somewhat different treatment. In hypersecretion the gastric glands secrete gastric juice in excess when they are stimulated by the food, but they may also do this when they are not stimulated by the food, i. e., when the stomach is empty; consequently in this condition the stomach contains abundant gastric juice nearly all the time. Hypersecretion obviously is always accompanied by hyperchlorhydria, but the latter condition may also occur as an independent affection without hypersecretion, and manifest itself by an excessive out-pouring of hydrochloric acid only when the stomach contains food. The two conditions, it will be seen, are closely related, the difference between them being more of degree than of kind. Hypersecretion may be considered as a continuous form of hyperchlorhydria occurring without the stimulus of food; hyperchlorhydria as a periodic form of hypersecretion and one that requires the stimulus of food to be produced.

Causes

Hypersecretion and hyperchlorhydria may be a part phenomenon of a general neurosis; they may follow mental, emotional over-strain or psychic shock; they may occur in the course of chlorosis; they may result from abnormal irritation of the gastric mucosa, if dietetic indiscretions, especially accompanied by the abuse of alcohol, tobacco, very hot foods, spiced foods, are committed; or they may be seen in anatomic lesions of the stomach or may finally constitute a reflex phenomenon emanating from remote organs of the body.

Causal treatment

The causal treatment, therefore, of hypersecretion and hyperchlorhydria must take all these elements into consideration. If the patient is a neuropath, then the neurasthenic or hysterical condition should be treated as described in the Section on *Gastric Neuroses.*

All emotional or mental over-strain should be avoided, any condition of anemia or chlorosis corrected, bad habits of eating improved and all factors that may become operative to irritate the gastric mucosa and the secretory nerves of the stomach, either directly or by reflex irritation, sought for and, if discovered, removed.

The diet

Inasmuch as the out-pouring of excessive gastric juice with an abnormal amount of hydrochloric acid is in most cases due to the stimulating effect of food which in these patients produces a quantitatively abnormal secretory reaction, the selection of the proper diet is of paramount importance. The diet, while adequately nourishing the patient, should be mechanically non-irritating, i. e., it should contain no coarse and indigestible particles like skin, tendons, cartilages, husks, seeds, pips, etc. It should contain no spices or condiments (mustard, pepper, paprica, cloves, etc.); nor any fruits or vegetables incorporating irritating oils (onions, radishes, horse-radish, etc.); nor should very acid foods, very hot foods, nor strong alcoholic drinks be administered.

Articles to be avoided

Abundant albumen

The diet should contain abundant albuminous pabulum; for the latter, owing to its power to combine with hydrochloric acid, acts as an antacid and thereby gives symptomatic relief. The various albuminous foods differ in their power to bind hydrochloric acid.

Meats

Best of all among the meats are beef, mutton and raw ham (Fleischer), but other forms of meat or fish or poultry are suitable food for these cases, provided they are not served in the form of cured, spiced or corned meats; for meats prepared in this way, on account of the spices, salts and extractives they contain, directly stimulate the flow of hydrochloric acid.

Selection of meats in presence or absence of motor insufficiency

The selection of the meats must also be governed somewhat by the presence or absence of motor insufficiency, atony, or dilatation of the stomach. If the stomach does not empty itself within a normal time (and in hyperchlorhydria it usually empties itself more rapidly than normal, especially if an albuminous diet is administered), then all coarse varieties of meats should be avoided (see page 387). If there is no motor insufficiency, then coarse meats are particularly useful, as they require much hydrochloric acid for their digestion and hence possess relatively great hydrochloric acid binding properties.

In hypersecretion or hyperchlorhydria associated with motor insufficiency or ectasy, finely divided meat, i. e., scraped or hashed meat, milk in small quantities and given at frequent intervals, and eggs are the best albuminous foods. Milk, gruels and soups made with flour of rice, wheat, barley, or with arrowroot, tapioca, sago, eggs; or milk rendered more nutritious by the addition of condensed milk or milk powder (see index) are all useful additions to the meat diet.

Starchy foods

Starchy foods are digested with difficulty in the stomach in hyperchlorhydria and hypersecretion. This is due to the fact that in hypersecretion, free hydrochloric acid is either present, when the food enters the stomach or appears there earlier than normal in simple hyperchlorhydria, so that it interferes with the amylolytic digestion of the starches in the stomach by inhibiting the action of the saliva that is swallowed. Starchy foods, therefore, unless promptly evacuated into the bowel, undergo abnormal fermentation and lead to the formation of irritating organic acids in the stomach; moreover their digestion in the bowel is interfered with as they enter the intestine in an hyperacid medium that must first be neutralized and rendered alkaline by the intestinal juices before the latter can digest starchy pabulum; for this reason amylaceous foods should never be given on an empty stomach in the disease under discussion and should always be given in relatively small quantities together with, or better still, after an abundant proteid diet.

Dextrinized carbohydrates

The assimilation of starchy foods is greatly facilitated by administering them in a dextrinized, i. e., partially predigested, form, as malted foods, toasts, zwieback or as dextrose. The latter, especially as it is readily absorbed from the gastro-intestinal tract, does not stimulate the hydrochloric acid secretion as much as other carbohydrate foods, so that the carbohydrate requirement of the organism can very well and safely be satisfied by the administration of dextrose in ten to twenty per cent. watery solution, given at frequent intervals. In atony or ectasy of the stomach with stagnation of stomach contents, dextrose solution, however, should not be given, especially as it possesses the power to some degree of drawing water into the stomach, an event that, as stated in a previous section, is to be especially avoided. Cane sugar is by far less useful than dextrose, for the former must first be inverted into dextrose and levulose before it can be assimilated, and this process occurs with great difficulty in an acid medium, or in a medium that is only slightly alkaline.

Dextrose solution

Cane sugar

Preparation of starchy foods

The mode of preparing amylaceous foods is important; the carbohydrates are best administered in the form of vegetable purées, mashed or baked potato, fruit sauces or in the form of different flours, with milk, as gruels or mushes as described above. Raw, stringy, coarse or acid vegetables or fruits, fresh or coarse breads, cereals containing husks should be carefully avoided.

Fats

Fats never do any harm in hyperchlorhydria and hypersecretion if given in a digestible form (see page 353); butter, cream, vegetable oils are all useful foods, whereas the animal fats, being less digestible, should be given very sparingly. Certain theoretical objections have been formulated against the administration of fats. The claim in particular has been advanced that they, too, require an alkaline medium for their digestion in the intestine and that in hyperchlorhydria and hypersecretion such a medium is not created as soon as it normally should be. These objections are overthrown by practical experience. The high caloric value of the fat, the empiric fact that they are well digested in the intestine and that they are well borne, despite the existence of hyperchlorhydria, especially if they are administered together with abundant proteid, renders them very useful additions to the diet in nearly all cases. If there is combined with hyperchlorhydria or hypersecretion an advanced degree of motor insufficiency, especially if gastrectasy is present, then they should, of course, be given sparingly.

Beverages

Alkaline mineral waters

Fluids, provided there is no gastric atony or ectasy, may be given abundantly. They act very well symptomatically by diluting the hyperacid gastric juice without interfering with the digestion of the albumens. Alkaline mineral water, especially the carbonated varieties, are especially useful as table beverages; for they combine antacid properties with slightly anesthetic powers (CO_2) and are consequently particularly useful when hyperchlorhydria is associated, as it so often is, with gastric hyperesthesia. That carbonated beverages should not be used in gastric atony or gastrectasy need hardly again be emphasized.

Alcoholic liquors, tea, coffee

Smoking

Alcoholic liquors, tea and, above all, coffee, should be forbidden, for they all somewhat irritate the stomach and stimulate the flow of gastric juice. Smoking, too, is best forbidden altogether.

Small meals at frequent intervals

Stomach should never be empty

Small meals containing abundant proteids, given at frequent intervals are better than large meals given at longer intervals. If small meals are administered over-secretion of gastric juice may often be avoided. It is a very good rule, however, never to let the stomach, in these cases, become altogether empty at any time during the day. The patient may have a breakfast, dinner and supper of moderate volume at the regular times, but should, in addition to these three main meals, drink a glass of milk or eat a soft boiled egg or two with a cracker or a piece of toast in the middle of the forenoon, in the middle of the afternoon and on retiring. If patients suffering from advanced degrees of hypersecretion or hyperchlorhydria complain of much pain or distress during the night, on account of the presence of free hydrochloric acid in the stomach, then a glass of milk taken in the middle of the night is often of the greatest value in relieving this very disagreeable symptom.

Night feeding

Lavage

Lavage of the stomach is of relatively small value in hypersecretion and hyperchlorhydria unless there is some motor insufficiency. In cases that suffer from nocturnal distress, as described above, washing out the stomach with a dilute alkaline solution just before retiring is, however, often of value.

ching

Douching the stomach (see index), after a cleansing lavage in the morning, with a 1:1000 silver nitrate solution or a two

Silver nitrate
Boric acid

per cent. boric acid solution is also often of some value. 1-200 cubic centimeters of the silver nitrate or boric acid solution are left in the stomach for two to five minutes and then washed out with water. The silver nitrate, in particular, seems in some cases to reduce the secretion of gastric juice for the rest of the day; at the same time it acts somewhat as an anesthetic to the irritable gastric mucosa, so that the silver nitrate treatment is of especial value in hyperesthesia of the stomach.

Remedies to suppress HCl excretion
Belladonna
Atropine

Of other remedies that can suppress the secretion of gastric juice, belladonna and atropine are the most important. The former given as the extract in combination with an alkali is often of signal value. The following prescription is useful:

℞

Extract of Belladonna,	0.03 gm.
Burnt magnesia,	0.5 gm.

M. Fifteen such powders.
Sig. One three times a day after eating.
(Ortner.)

Atropine is best given hypodermically in doses of from one hundredth to a fiftieth of a grain, once a day, in the morning.

Alkalies

Alkalies are, as a rule, indispensable in the treatment of hyperchlorhydria and hypersecretion. The chief object of administering them is to neutralize the excessive hydrochloric acid that is poured into the stomach. In order to be effective they must be given in large doses after meals, at the period when digestion is at its height. In hypersecretion it may be necessary to give them also when the stomach is empty, i. e., before eating or in the middle of the night in order to neutralize the acid that is present at that time. Sodium bicarbonate is the most popular alkaline remedy, but it should be used with some care as it is slightly irritating to the mucosa. The copious development of carbon dioxide is generally distressing to the patient on account of the gastric distention and belching it produces and may even be dangerous in ulcer. The sodium chloride that is formed, moreover, somewhat stimulates the secretion of hydrochloric acid. It will be seen, therefore, that the popularity of sodium carbonate is not deserved.

Sodium bicarbonate

Magnesia usta and magnesium carbonate

Far better as antacids are magnesia usta or magnesium carbonate. Magnesia usta is probably the best remedy of all, for it is non-irritating to the stomach, it is capable of binding nearly four times as much hydrochloric acid as an equal bulk of sodium carbonate, and the magnesium chloride that is formed does not stimulate the hydrochloric acid secretion in the stomach.

magnesia usta, moreover, possesses the power of binding any acid that may be formed from fermentation in the stomach, and, finally magnesia salts possess slightly laxative properties that are useful in order to counteract any tendency to constipation.

The following mixture of sodium carbonate and magnesia especially is very useful and answers all purposes in practice:

℞

Sodium carbonate,
Burnt magnesia, of each, 100 parts
Sugar of milk 150 parts

This mixture should be prepared in bulk by the patient and should be taken in half to one teaspoonful doses, in milk, at the height of digestion.

Another good preparation is a compressed tablet containing equal parts of sodium carbonate and magnesium carbonate. The administration in a compressed tablet favors slow solution of the alkalies in the stomach and hence somewhat prolongs their effect. Moreover, this mixture leads to a very slow evolution of carbon dioxide. Other antacids that can be used are biborate of soda and calcium carbonate in the form of precipitated chalk, given in a third of a teaspoonful dose at the proper times.

Carbonated alkaline waters (see above) and also saline waters are of considerable value in the treatment of hypersecretion and hyperchlorhydria. These waters are especially efficacious when taken at certain watering places or resorts; but a great part of the good effect observed from their use must be attributed to the careful regime that the patients follow at these resorts, to the respite from every-day cares and worries, to the agreeable psychic stimulus and suggestive effect that is granted when they visit these watering places. The successful management of their cases, moreover, by resort physicians, who have much experience with this particular class of invalids plays an important rôle. The different waters administered at home are certainly less effective than when they are taken at watering places.

GASTRIC HYPOSECRETION AND ACHYLIA GASTRICA.

The reduction or the complete suppression of the gastric juice may be a part phenomenon of a general neurasthenia or hysteria, or a symptom of various organic diseases of the stomach (carcinoma, chronic gastritis, atrophy, amyloid degeneration), or it may attain the dignity of an independent neurosis. Simple hypoacidity or anacidity are probably never seen. In most cases the secretion of the gastric enzymes, too, is reduced, so that it is more proper to speak of hypochylia and achylia.

Diet

The most important element in the treatment of hypochylia and achylia gastrica is the selection of the proper diet. The regulation of the food is dependent on the presence or absence of motor insufficiency. If the motor power of the stomach is good, then every effort should be put forward to maintain it so, and all coarse and indigestible foods, large meals, large quantities of liquid should be avoided as a prophylactic measure. The patient, therefore, should receive small meals at frequent intervals, consisting of easily digestible meats, abundant carbohydrate and considerable quantities of fat. If the motor power of the stomach is impaired, especially if there is in combination with hypochylia and achylia gastrica some gastric atony or gastric ectasy, then the motor insufficiency becomes the more important element to be considered and it should be treated as described in a previous section.

Presence or absence of motor insufficiency

The motor power is good

Provided the motor power of the stomach is good or only slightly impaired, then meats should be allowed. In selecting the kind of meat, its digestibility should be considered above all things (see table on page 349), consequently broiled or stewed poultry, certain varieties of fish, raw, rare, scraped or hashed beef, mutton or ham, calves' brains, sweet-breads, all finely divided and carefully freed from skins, tendons, etc., and administered in small quantities, are permissible.

The motor power is impaired

If the motor power is seriously impaired, meats are best avoided altogether, or, if given at all, administered in very small quantities; for one must realize that in the condition under discussion the digestion of albuminous pabulum in the stomach is very decidedly impaired or altogether inhibited; consequently serious harm can be done to the stomach unless the gastric contents can promptly be propelled into the bowel where the disassimilation of the albumens can be vicariously carried on by tryptic digestion. In certain cases in which the motor power is not too seriously impaired, pancreas preparations can to advantage be administered together with small quantities of meat; for in this way intestinal digestion is begun in the stomach and the disassimilation of the albumens aided. If there is some hydrochloric acid secretion, the pancreas preparations must, of course, be given with sufficient alkali to more than neutralize the gastric hydrochloric acid.

Pancreas

Eggs, milk, vegetables Albumens

What has been said of meats applies with equal force to other albuminous foods, i. e., eggs, vegetables rich in albumen and milk. Eggs should be given in a semi-liquid form or finely divided, i. e., either soft boiled, or poached or as scrambled eggs, or

[illegible]

[illegible] condiments, such as [illegible] spices and [illegible] preparations [illegible] preparations slightly irritate the [illegible] the flow of gastric juice. For the same [illegible] of alcoholic beverages, either brandy or [illegible] a little champagne, a light Moselle, Burgundy [illegible] useful.

Alcoholic beverages

Lavage

Lavage of the stomach is rarely necessary unless there is, at the same time, an advanced degree of motor insufficiency. If the motor power of the stomach is impaired, then the same indications [illegible] exist as in any other form of motor insufficiency.

[illegible]

Rinsing the stomach with a 1:100 salt solution is in some cases a very useful procedure if persistently carried out: for the introduction of salt into the stomach in this way seems to exercise a stimulating effect upon the secretion of hydrochloric acid. Rinsing with salt solution is best performed early in the morning before breakfast or after a cleansing lavage. Many of the saline waters, taken in small quantities on an empty stomach, answer the same purpose.

Saline waters

The use of medicines to stimulate the flow of hydrochloric acid and of gastric enzymes is theoretically indicated, but practically very problematical. The administration of small quantities of sodium bicarbonate before meals is claimed to be an efficient means of stimulating a reactive flow of hydrochloric acid. This effect, however, is very doubtful (see page 362). Hydrochloric acid given in small quantities, together with one of the stomachics before meals, is fully as useful (see page 361). The use of hydrochloric acid even in large quantities after meals, or the use of peptic enzymes, is of doubtful utility as a substitution therapy. If the motor power of the stomach is good the artificial ingestion of these gastric products is at least superfluous, because the intestine vicariously assumes peptic digestion; in fact, in such cases the administration of large quantities of hydrochloric acid by reducing the alkalinity of the intestinal juices may somewhat retard tryptic digestion. If the motor power of the stomach is impaired, then lavage and other measures that have been discussed in the Section on *Motor Insufficiency* are far more effective than the use of hydrochloric acid and pepsin.

Drugs

Sodium bicarbonate before meals

Hydrochloric acid

Stomachics

Enzymes

In the purely neurotic form of hypochylia and achylia gastrica, a variety of hydriatic measures, massage, electricity, the selection of a proper climate and resort and, to some extent, suggestive treatment are all useful. For all these methods, their exact indications and employment I refer to the next Section.

Neurotic form

II. GASTRIC NEUROSES.

To the category of gastric neuroses in the broader sense belong certain functional disturbances of the stomach that are produced by lesions of the stomach itself, but in which a marked disproportion exists between the organic cause and the functional effect, indicating that some perversion must exist about the nervous apparatus governing the function that is perverted and causing it to react abnormally to a stimulus that, in a healthy subject, would produce a (quantitatively) different reaction.

Definition and causes

In anatomic stomach lesions

Gastric neuroses proper, however, occur without any anatomic changes about the stomach. In most cases they are of reflex origin and superinduced by irritation of the gastric nerves from some remote diseased organ. In this class of cases, as well as in the first mentioned group, the stomach nerves must again be considered to be in an abnormal state of irritability. The two

Without anatomic stomach lesions

cluding the sensation of appetite. For the sake of clearness neurotic disturbances affecting these different spheres may be discussed separately. It is important to realize, however, that perversions of several functions are, as a rule, associated, that in most cases perversions of single functions alternate. This alternation of functional disorders about the motor, secretory and sensory apparatus of the stomach, as well as the fact that the subjective distress of the patient is, as a rule, out of proportion to the severity of the functional disorder that is objectively determinable, may be considered to some extent characteristic of all gastric neuroses.

Motor neuroses

Chief among the motor neuroses are spasm and insufficiency of the cardia and of the pylorus, hypermotility and peristaltic unrest of the stomach, nervous vomiting, nervous belching and gastric atony; among the secretory neuroses hypersecretion and hyperchlorhydria, hyposecretion and nervous achylia gastrica; among the sensory neuroses, gastric hyperesthesia, gastralgia and, in a broader sense, nervous dyspepsia, so-called; in the latter condition no motor or secretory perversions of the stomach are discoverable, but the patients complain merely of a great variety of disagreeable subjective sensations during and after eating. Perversions of the appetite, finally, manifesting themselves as anorexia, akoria and bulimia may also be included under the category of sensory neuroses.

Secretory neuroses

Sensory neuroses

Perversions of the appetite

Correction of neurotic taint

The treatment of all these forms of gastric neuroses consists primarily and chiefly in correcting the underlying neuropathic taint, that is, in restoring normal tone, normal equilibrium to the nervous system at large, in re-establishing central autonomy, if it is lost; and in addition any lesion that may be considered a cause for reflex irritation of the gastric nerves either in the stomach or in other organs (see above) must be sought for and, if possible, removed.

The methods at our disposal for curing the neuropathic taint are largely psychical and physical. The element of suggestion, education and moral suasion enters largely into this treatment; while rest, hydrotherapy, the selection of a proper climate and resort, massage and, to some extent, electricity are all important adjuvants to the treatment. Medicines play a very subordinate rôle.

In addition certain special methods of treatment may have to be instituted that are intended to relieve certain symptoms.

Methods for treating the neurotic individual

In order to avoid endless reiteration, the general treatment of the neurotic individual that is indicated in all forms of gastric neuroses may be discussed first, and the special treatment groups differ merely in this, that in the first reflex irritation emanates from some intra-gastric source, whereas in the second category the primary focus of reflex irritation lies outside of the stomach; thus eye-strain, certain organic lesions of the brain, the cord, the meninges, disorders about the sexual sphere, intestinal parasites, violent pain anywhere in the body, as for instance renal or hepatic colic, angina pectoris, peritonitic pain from different causes, etc., may all produce gastric neuroses.

Reflex causes

Psychic causes

In a third group of cases psychic causes, mental and emotional disorders, sudden emotional shock, depression, anger, fear, mental over-work all react on the innervation of the stomach and produce a variety of functional disorders.

Intoxications

Finally, various intoxications as from lead, alcohol, morphine, tobacco; infectious toxemias, notably in tuberculosis and malaria; different forms of self-poisoning as uremia, acidosis, may all produce functional gastric disorders that have no anatomic substratum in the muscular, sensory or glandular apparatus of the stomach.

Neuropathic disposition

All these factors, as already indicated above, cannot, however, operate to produce gastric neuroses unless there exists as a basis a neuropathic disposition which may be either congenital or acquired. The diagnosis, therefore, of a gastric neurosis should never be made from negative evidence alone, i. e., on the ground that no anatomic gastric disorder is discoverable, but it should only be arrived at if to this negative evidence is added the positive discovery of general neuropathic stigmata in the afflicted subject.

Difficulty of rendering the diagnosis

It is clear, therefore, that the diagnosis of a gastric neurosis should always be made with the greatest conservatism. It is probably never altogether positive but generally tentative and preliminary; for, in many cases, one must realize that the discovery of an anatomic basis is impossible merely on account of the deficiency of our methods and on account of lack of skill or thoroughness on the part of the physician. To determine definitely that an individual is a neuropath is a very precarious undertaking. In all patients who are not frank neurasthenics or hysterics the dyspeptic symptoms of an incipient tuberculosis or chronic uremia or intestinal toxemia, gastric disorders occurring in the presence of adhesions about the stomach (and intestine) are consequently often grossly misinterpreted. Gastric neuroses pure and simple, I believe to be really quite rare, and the diagnosis gastric neurosis or nervous dyspepsia is often merely a cloak for ignorance or carelessness.

Motor secretory, sensory, neuroses

Neurotic disorders of the stomach may affect either the motor, the secretory or the sensory apparatus of the organ, including the sensation of appetite. For the sake of clearness neurotic disturbances affecting these different spheres may be discussed separately. It is important to realize, however, that perversions of several functions are, as a rule, associated, that in most cases perversions of single functions alternate. This alternation of functional disorders about the motor, secretory and sensory apparatus of the stomach, as well as the fact that the subjective distress of the patient is, as a rule, out of proportion to the severity of the functional disorder that is objectively determinable, may be considered to some extent characteristic of all gastric neuroses.

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Institution and resort treatment

Most cases of gastric neuroses do best, by far, when treated either in an institution or at a resort. In the latter case the good effects result from a change of scene, from temporary freedom from worry, excitement and business cares and the attendance of skillful medical men who are specialists in the treatment of these cases, because they see so many of them. The feeling, moreover, that something definite is being done exercises both a restful effect on irritable nerves and, at the same time, a strongly suggestive effect, the value of which, in these patients, cannot be overestimated. In most resorts, moreover, and this applies also to sanitaria, the various hydrotherapeutic and electric treatments, massage and proper dietetic measures can all be carried out much better than at home.

Simple hydrotherapy at home

If the patient cannot or will not enter a sanitarium or go to some resort where good institutional facilities are available, the following simple hydrotherapeutic measures, which can be pursued at home, may be of considerable benefit:

Hot baths

Simplest of all is immersion in a bath of about 95° F. The patient should remain perfectly still in the water for about five minutes. The temperature of the water slightly below the body temperature exercises a distinctly soothing influence. After the bath the patient should be dried with a rough towel and the surfaces of the body rubbed with alcohol. The patient should then be put to bed between woolen blankets and should lie there for an hour or two. This treatment may be applied every day either early in the morning or late at night before retiring.

Wet, cool pack

Or the patient may be wrapped in a cloth wrung out of cool water of room temperature and the surfaces of the body energetically slapped and kneaded through the wet sheet. After the treatment the patient's body should again be rubbed dry with a rough towel, treated with alcohol, after which he is put to bed between woolen blankets as above. Or a large Priessnitz compress may be applied as follows: The patient is wrapped in a sheet wrung out of water of body temperature, the wet sheet is covered with a dry sheet and a flannel blanket. In this compress the patient remains for one or two hours by which time slow evaporation of water has occurred and the first sheet will usually be found to be perfectly dry. The patient is then given a massage with cocoa butter and again kept in bed for an hour or two between woolen blankets.

Priessnitz compresses

Half baths

A very useful measure, finally, are half baths. The patient should sit down in a bath tub containing water of 80° to 90°.

The water should reach to the umbilicus. An attendant pours water of the same temperature as the bath water over the back and shoulders of the patient; and at the same time he energetically rubs the back and arms, while the patient himself rubs his chest and sides. The temperature of the water that is poured over the patient may be gradually cooled off. This half bath may to advantage be followed by a spray douche, the temperature of which is gradually cooled. The patient is then rubbed dry with a rough towel and the surface of the body treated with alcohol and the patient put to bed between blankets as above.

Spinal sponging

A very simple measure that the patient can carry out himself is to fill two basins with water, the one with water of about 100°, the other with cold water. Into each basin a large sponge is placed. The patient sits on the edge of the bath tub and alternately places the sponge filled with hot and cold water on the nape of the neck and squeezes it out so that the water runs down the back into the bath tub. Hot and cold water are, in this way, alternately applied about ten times. The patient then rubs his back thoroughly with a Turkish towel until a glow is felt.

In institutions many other hydrotherapeutic means can be employed that require special facilities so that they need not be described in this place.

Massage

Massage should be performed only by an expert and it is unnecessary to describe the technique in this volume. The effect of general massage is soothing to the whole nervous apparatus and when combined with rest is one of the most efficient means to quiet hyperirritable nerves, to correct irritable weakness of the nervous system at large or of certain nervous areas.

Faradization

The soothing effect of massage can be enforced by general faradization, by the faradic bath or by combining massage with the full bath or half bath or the application of large Priessnitz compresses. The best time for administering massage, in most cases, is either early in the morning or in the evening before retiring.

Weir Mitchell cure

Many patients suffering from gastric neuroses of various organs do very well under a Weir Mitchell fattening cure. This consists largely in over-feeding the patient with a nutritious, assimilable diet administered at frequent intervals. In order to be properly carried out the patient should be sent to an institution where he can be isolated and where, above all, he is removed from sympathetic friends and relatives; where absolute rest can be enforced, and massage and hydrotherapeutic means can be scientifically administered. In addition, the suggestive effect of such a treatment should never be underestimated. The personality of the physician and of the attendants in an institution and, in many cases, firmness to the verge of severity, are very important elements in the treatment.

Dangers of exclusive milk feeding

An exclusive milk diet is not only unnecessary, but may even become harmful, because most cases soon acquire a violent distaste to this monotonous feeding; because the ingestion of such large quantities of liquid may be detrimental in certain forms of gastric neuroses; and because an exclusive milk diet generally leads to very obstinate constipation. It is impossible to designate a diet that applies to all cases. It is necessary, generally, to individualize and to arrange a dietary somewhat according to the neurosis that the patient is suffering from. Broadly speaking, fats and carbohydrates should predominate and only enough albumen should be given to satisfy the nitrogen requirements of the patient.

Proper diet

The appearance of dyspeptic symptoms does not necessitate discontinuing the treatment, especially if they appear on the first day or two, for they usually disappear if the treatment is carried out for a few days consecutively.

Heat to the epigastrium

The application of heat to the epigastrium before each meal and during the meal, sometimes continuously, often prevents or stops disagreeable subjective symptoms about the stomach. The constipation, that not uncommonly supervenes, is best counteracted by increasing the ration of fruit sauces, fresh vegetables and fats or by adding bran with some cereal, cream and sugar to the diet. In most cases it will be necessary in addition to give soap-suds enemata every few days, which may be medicated with a little glycerin or, if there is much flatulency, with a few drops of turpentine. A little rhubarb or cascara every day can do no harm. The administration of large doses of calomel, which for a long time constituted a popular routine measure in instituting a Weir Mitchell treatment is to be condemned as unnecessary and, in some cases, directly harmful.

Constipation

The following dietetic schedule approximately illustrates the character of the diet that the patient should receive when undergoing a Weir Mitchell fattening cure:

Diet schedule

First meal. 7 a. m. 250 cc. of milk-cream mixture* or of cocoa made with equal parts of milk and water, three crackers.

Second meal. 9 a. m. A cup of beef, mutton or chicken broth, twenty-five grammes of scraped beef with butter and salt, two pieces of toast with plenty of butter.

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*Two-thirds milk; one-third cream; a teaspoonful of lime water.

Third meal. 11 a. m. 200 cc. of egg-nog, two pieces of zwieback with butter.

Fourth meal. 1 a. m. A cup of broth with rice or barley, 50 to 60 grammes of roast, stewed or boiled meat, poultry or fish, two baked or boiled potatoes or their equivalent in mashed potatoes, a dish of some stewed vegetable, a large saucer of apple sauce or preserves.

Fifth meal. 3 p. m. A glass of egg-nog with two crackers.

Sixth meal. 6. pm. Twenty to thirty grammes of cold meat or poultry, two slices of toast and butter.

Seventh meal. 8 p. m. 200 cc. of milk-cream mixture, two crackers.

Eighth meal. 10 p. m. A glass of egg-nog with two teaspoonsful of brandy and two crackers.

Many patients assert that they cannot take this quantity of food. If strenuous objections on the part of the patient are encountered, they may have to be fed by means of a nasal catheter. If artificial feeding of this kind must be resorted to for the first few days, then, of course, a liquid diet must be given. A little firmness on the part of the physician, however, will usually succeed in overcoming the objections of the patient.

Exercise

After two or three weeks of this treatment the patients usually fare better if they are allowed a little exercise, and can go out into the fresh air for an hour or so once or twice a day. The duration of this Weir Mitchell fattening and rest cure should vary from three to six weeks according to the improvement manifested in the patient's condition.

MOTOR NEUROSES.

Hypermotility and peristaltic unrest

Hypermotility of the stomach and peristaltic unrest of purely nervous origin are rare. These motor manifestations may be considered as a spasm of the whole gastric musculature. Aside from treatment directed against the underlying neurosis, all irritation of the gastric mucosa by coarse and indigestible foods, by very hot or very cold, spiced or alcoholic articles, should be carefully avoided. The diet should be bland and non-irritating and should not distend the stomach by its bulk or by the formation of gases. The use of sedatives or narcotics, bromides, opiates, belladonna, atropine or hyoscyamus will rarely become necessary.

Spasm of the cardia

Spasm of the cardia is also rarely a primary neurosis, but generally accompanies various organic disorders of the esophagus, the cardiac orifice or the cavity of the stomach. It may, therefore, be merely a symptom of a variety of causes that must be carefully sought for and removed as described in other sections. It may, however, be a primary neurosis and if this is the case it is usually associated with hyperirritability of the esophagus. Here, again, therefore, the ingestion of food and drink that may irritate the esophageal muscosa, either mechanically, chemically or thermically, must be avoided as a prophylactic measure. The insertion of sounds of gradually increasing calibre and leaving these sounds in place is the best method of treating cardiospasm, provided no organic lesion about the cardia of an ulcerative character contra-indicates the use of bougies. In extreme cases the above mentioned sedatives and narcotics administered hypodermically or in suppository, combined with complete abstinence from food for several days and rectal alimentation, may become necessary.

Spasm of the pylorus

Spasm of the pylorus is almost always due to some intragastric irritation. The neurotic character of pyloric spasm is problematical in any case. If no determinable cause like ulcer, hyperchlorhydria or some mechanical lesion about the pylorus is discoverable, and if symptoms of pyloric spasm (pain, increased gastric peristalsis, vomiting) appear when food that is irritating by its texture, temperature or mechanical constitution enters the stomach, then the existence of an increased pyloric sphincter reflex, i. e., pyloric spasm of neurotic origin, may be suspected. In an overwhelming majority of cases, however, some organic disorder or secretory perversion about the stomach will be found.

The treatment consists in the removal of any mechanical or organic condition about the stomach that may be incriminated with causing the spasm, and in correcting the underlying neurosis, in the neurotic type. The treatment in all cases should concern itself with removing or counteracting any accompanying hyperchlorhydria. In extreme instances, again, sedatives and narcotics may have to be used. The bougie treatment of pyloric spasm has been variously attempted, but this mechanical means of treatment is manifestly a procedure accompanied by such immense technical difficulties and uncertainties that it is hardly to be considered practical.

Nervous belching

Nervous belching is in most cases an hysterical phenomenon due to the swallowing of air. The treatment is largely psychic, i. e., educational. Very often persistent attacks of nervous eructation can be stopped, like hiccup, by suddenly frightening the patient. In other cases the patient should be ordered to breathe with the mouth open for half an hour two or three times a day. This exercises a pronounced psychic effect and, at the same time, prevents the patient from swallowing the air, at least during the periods of mouth-breathing, and hence prevents eructation. If there is much distention of the stomach with air (pneumatosis), passing the stomach tube brings prompt relief. If there is any doubt in regard to the character of the belching, a fermentation test with the stomach contents will quickly tell the tale.

Aside from the suggestive treatment and general measures directed towards the neurasthenic and hysteric state, bromides, belladonna and atropine, and in some cases, especially in pronounced pneumatosis, the hypodermic use of morphine, may become necessary. Silver iodatus, in doses of a sixth of a grain (0.01) after eating, and strychnine in one-thirtieth to a sixtieth of a grain doses also after eating, are recommended.

The diet should, of course, contain no carbonated beverages and the minimum of articles that can undergo gaseous fermentation in the stomach should be allowed; for the development of gas in the stomach by producing real eructations may by suggestion start an attack of nervous belching.

Nervous vomiting

Nervous vomiting, in a broad sense, includes vomiting originating from reflex irritation from the sexual sphere, from floating kidney, from diseases of the brain and cord, from colic in the liver or the kidneys, from peritoneal irritation and from the pregnant uterus. Here the treatment of the underlying cause and the correction of a nervous predisposition, that must be assumed to exist in all cases becomes necessary. In every case of nervous vomiting, the gastric irritability should be reduced. In severe cases the patient should remain in bed, should abstain altogether from food for a few days and should be allowed to swallow only teaspoonful doses of ice cold drinks like milk, tea, champagne, or ice pills. No definite dietetic regulations can be formulated in the neurotic type of vomiting. Of drugs morphine, codeine and belladonna hypodermically or in suppository are the best. Morphine may be given in doses of an eighth of a grain in combination with a two-hundredth of a grain of atropin hypodermically, once or twice a day; codeine or codeine phosphate in doses of half a grain (0.03) hypodermically, once or twice a day; or opium and belladonna in suppositories containing half a grain (0.03 gm.) each of the extract of opium and the extract of belladonna and administered once or twice a day.

Other remedies that are occasionally useful are chloroform given in the dose of three to five drops on sugar or in teaspoonful doses of ice cold chloroform water; menthol in ethereal solution (1 to 10) in the dose of five to ten drops three times a day; chloral hydrate in a solution of one part to ten parts of water may be given in fifteen drop doses in a teaspoonful of ice water every two or three hours. Bromides and chloral nitrate, ten to twenty grains each, may be given by rectum.

Lavage is generally superfluous in these cases. Douching with silver nitrate in 1:1000 solution, or simple irrigation of the stomach, is occasionally useful. In employing lavage or douching the suggestive effect exercised by passing the stomach tube is generally more helpful than the procedures themselves.

Pyloric insufficiency

Pyloric insufficiency is usually due to mechanical causes operating either to interfere with the closure of the pyloric sphincter (cicatrization, ulceration, etc.) or leading to abnormal stretching of the pyloric ring. Nervous cases of pyloric insufficiency due to paralysis of the motor nerves supplying the sphincter are seen in hysteria and in certain diseases of the spinal cord. The neurotic form is exceedingly rare and should only be diagnosed if the organic form can be definitely excluded. In the organic variety the treatment is exclusively causal, in the nervous form, it is directed towards correcting the general neuropathic taint, and local treatment has no effect.

Regurgitation and rumination (insufficiency of the cardia)

Regurgitation and rumination (insufficiency of the cardia) should be treated chiefly by education and suggestion and by measures directed towards correcting the underlying neurosis. The patients should be told to chew their food thoroughly and to eat slowly. Inasmuch as the disease is frequently produced in friends or schoolmates of the patients by imitation, isolation of the patient in an institution, aside from facilitating the treatment of the patient himself, is often effective in preventing the spread of the disease in persons closely associated with the sufferer.

Neurotic atony

Gastric atony has already been discussed in a previous section (see index). The treatment of the neurotic variety differs in no way from that produced by organic or mechanical causes.

SECRETORY NEUROSES.

Neurotic secretory perversions

The secretory neuroses of the stomach that manifest themselves as hypersecretion and hyperchlorhydria, as hypochlorhydria and achylia, have already been discussed in special sections, so that it is needless to repeat here what has been said. If one is dealing with a purely neurotic form of secretory neurosis, then, in addition to the dietetic, mechanical and medicinal means that have been recommended for the treatment of these conditions, recourse must be had to the use of the general hydrotherapeutic, and electrotherapeutic means and all the other measures that are used in the treatment of neuropathic individuals. In the same sense organic lesions in and around the stomach or in remote organs that may by reflex irritation cause functional perversions of the gastric secretion, must be sought for and corrected, if possible.

SENSORY NEUROSES.

Gastric hyperesthesia

Gastric hyperesthesia may occur as an independent affection, but it is usually found attended by secretory perversions of the stomach. It is indicated by a variety of abnormal sensations about the stomach, as fullness, tension or burning, or by severe paroxysms of pain, i. e. gastralgia proper. Gastralgia occurs in many organic diseases of the stomach and also in affections of organs adjacent to the stomach as, for instance, in the presence of adhesions, aneurism of the abdominal aorta, aortic insufficiency (see page 19), in neuroses of the solar plexus, especially in sexual disorders, in cord diseases (gastric crises of locomotor ataxia) and in a variety of intoxications and infections, in constitutional diseases (poisoning with tobacco or lead, in malaria, Addison's disease, the uratic diathesis, chlorosis, tuberculosis, etc.). Finally, paroxysms of gastralgia may be a part phenomenon of neurasthenia or hysteria.

Gastralgia

Causal treatment

Manifestations of gastric hyperesthesia or attacks of gastralgia occurring when the stomach is empty are best relieved by the ingestion of food. If hyperesthesia or gastralgia are not due to remediable causes, or if the latter are not discoverable or, again, if these symptoms, occurring in a neurotic subject, do not yield to the general treatment of the underlying neurosis, then certain measures for the symptomatic relief of gastric pain must be employed.

Symptomatic treatment

Heat to epigastrium

Winternitz compress

One of the most useful measures is the application of heat to the epigastrium, either by means of hot poultices made of oatmeal, linseed, or bread, and medicated with a few drops of opium or belladonna tincture; by the use of a Leiter coil (see index) through which hot water is flowing, or by means of a so-called Winternitz compress applied as follows: A wet linen cloth is applied over the epigastrium; over it is placed a Leiter coil through which flows hot water and over this again another wet sheet; the whole is covered with a flannel. By the use of this Winternitz compress a prolonged heat effect and considerable counter-irritation is produced. The thermophore, as described on page 39, is also useful for the application of continuous heat to the epigastrium.

Electrization of stomach

Electrization of the stomach too is of some value in the treatment of hyperesthesia and gastralgia. Either the intraventricular or extra-ventricular method may be employed. In the former case the anode should be inserted into the stomach through a stomach tube, in the latter case the anode should be applied to the epigastric region by means of a large plate electrode. The cathode is connected with a large sponge electrode applied either to the sternum or between the shoulder blades.

A weak galvanic current is applied for not longer than ten minutes (see also page 390).

Gastric douches

Douching the stomach with chloroform water or with silver nitrate solution 1:1000, or simply with hot physiological salt solution, is a very useful measure, especially in cases that do not yield to the simple application of heat to the epigastrium.

For internal use a variety of remedies can be employed.

Morphine

Morphine in the dose of one-eighth to one-fourth grain, or codeine phosphate in the dose of half a grain, may occasionally have to be given hypodermically, or a suppository containing extract of opium and belladonna (see page 409), may be used. A few drops of chloroform on ice, or ice cold chloroform water in teaspoonful doses, sometimes afford relief. Cocaine is a useful remedy administered by pouring twenty drops of a five per cent. solution of cocaine in a third of a glass of water and administering a teaspoonful of this solution every fifteen minutes. Bromoform in two or three drop doses on ice, or in a teaspoonful of ice water, or in a 1:1000 solution, a teaspoonful every two or three hours, may also be used. Finally, antineuralgic remedies as antipyrin, phenacetin in five to fifteen grain doses (0.3 to 1 gm.), lactophenin or exalgin in eight to fifteen grain doses (0.5 to 1 gm.), or pyramidon (especially in tabetic crises) in the dose of fifteen to thirty grains (1 to 2 gm.) administered with water two or three times in one or two hour intervals, may be employed.

Chloroform

Cocaine

Bromoform

Antineuralgics

Nervous dyspepsia

In the treatment of "nervous dyspepsia" suggestion and the appropriate hydrotherapeutic and electrotherapeutic measures, massage or a Weir Mitchell fattening rest cure, as described above, are usually sufficient to bring about a cure. Any reflex disorders should be removed (see page 402). The patients should be protected from care, worry and excitement and any psychic or emotional shock. No fixed rules in regard to the diet can be formulated. Some patients do exceedingly well on a Weir Mitchell fattening cure, others on a starvation plan, some thrive on an exclusively vegetable diet, others on milk feeding, still others, on a mixed general diet. Very often a change from one diet to another acts beneficially for a time; and it is generally a good plan, partially, it must be confessed, on account of the suggestive effect produced, to alternate with the diet, feeding the patient for a time on vegetables exclusively, letting him hunger for a week, and giving him rectal feeding for another period, then allowing a general diet for a time or a milk diet, or instituting a Weir Mitchell cure.

Alternation of diet

Starvation plan

A starvation plan with rectal feeding should always be given a trial. Within certain limitations the caprices of the patient should be considered and if a general diet is permitted, great care should be exercised to render the food palatable and tempting to the patient. In no disease are the arbitrary methods of the doctrinaire more dangerous than in this disorder. Care should always be exercised not to administer any really indigestible foods that might produce genuine dyspepsia; for the latter would produce a bad moral effect upon the patient who cannot distinguish between a real and a nervous dyspepsia. That every endeavor should be put forward in all these methods of feeding to maintain full nutrition, excepting possibly for short periods of time, need hardly be emphasized.

Smoking

Liquor

Smoking is, as a rule, to be forbidden. Alcohol in the form of dilute whisky or brandy, Claret or Moselle as a table beverage, may be used in moderate quantities.

Rest after eating

Rest after eating is also a useful measure for reasons that have been discussed above. Lavage and douching are rarely indicated in nervous dyspepsia and whatever good effects may be witnessed from the use of these measures must be attributed largely to their suggestive influence. Medicines play a very subordinate rôle in the treatment of nervous dyspepsia. Stomachics and hydrochloric acid given as discussed on page 359f, can do no harm. Any accompanying constipation or diarrhea should be combated chiefly by dietetic and mechanical means and by medicines only in extreme cases.

III. THE INTESTINE.

ACUTE INTESTINAL CATARRH.

Causal treatment

Malarial diarrhea

Uremic diarrhea

Most cases of intestinal catarrh are due to irritation of the bowel wall by toxic or infectious agencies. The latter may be ingested with the food and irritate the bowel directly from within, or they may be borne to the intestinal wall through the blood. Causal treatment must attempt, therefore, above all things, to promptly rid the organism of these toxic bodies. In the case of the blood-borne toxins this is not always an easy task. In some instances, however, as in malarial toxemia where we possess specific antimalarial treatment (see page 546), this is possible. In catarrh of the bowel occurring in the course of other infections and intoxications and due to the circulation of bacterial toxins or of metabolic poisons (e. g., uremic diarrhea) through the bowel wall with irritation of the bowel mucosa, very little can be done towards attacking the primary cause of the intestinal disorder.

Acute intestinal catarrh due to the ingestion of toxic material is much more amenable to causal treatment. If the poison is one that is foreign to normal food and if its character is known, the appropriate antidote should, self-evidently, be administered at once, and removal of the offending material promoted by lavage of the stomach and free evacuation of the bowel contents.

In all forms of food poisoning, whether due to mechanical irritation of the bowel wall by coarse foods or compacted feces in chronic constipation, or to chemical irritation from poisons contained in spoiled foods or formed from the gastro-enteric contents by abnormal bacteria vegetating in the bowel, prompt emptying of the intestine and evacuation of the noxious agency is the first rule.

Eliminants

The two principal eliminants that should be employed in these cases are calomel and castor oil. Drastic purgatives and salines should not be used in acute catarrh of the bowel, as they irritate the inflamed mucosa still more.

Calomel

Castor oil

Calomel is best given in one large dose of three to five grains (0.2 to 0.3 gm.). Smaller doses are more apt to irritate the bowel wall without exercising so pronounced a purgative effect. Castor oil should be given in the dose of half an ounce to an ounce (one to two teaspoonfuls to an infant or a little child) either in gelatin capsules or in a small glass of beer or in beef tea; or the oil may be mixed with peppermint water, or with milk flavored with peppermint oil and rapidly gulped down; or it may be poured into a wine glass and an equal quantity of sherry or port wine superimposed and the whole taken in one swallow. In order to mitigate the severe griping and colic that frequently follows the use of castor oil, a few drops of tincture of opium, or a drop of cinnamon oil, may to advantage be added to the dose.

Bowel irrigation

Mode of inserting rectal tube

Removal of the offending material from the bowel should also always be promoted by irrigation of the large intestine. The rectal catheter used for colonic flushings should be about thirty to forty centimeters long and should have a lumen of about one centimeter. Before inserting it all the air should be driven out of the tube by filling it with water from the funnel or irrigating bag it is connected with. The tube should always be well lubricated with oil or with vaseline and should be inserted gently and carefully with a slow rotary movement until fifteen to thirty centimeters have entered the bowel. If the tube catches it should not be pushed in forcibly, but slowly withdrawn a little and reinserted. The patient should be placed either on the left side with the right leg drawn up and the hips elevated by one or two pillows, or in the knee-chest position, or in the dorsal position with raised hips. As soon as the tube is in place the irrigating fluid is allowed to flow in very slowly and under low pressure, i. e., from a height not to exceed two feet. Fully ten to fifteen minutes should be consumed in injecting two liters; in this way retention of the irrigating fluid is made much easier and less pain and discomfort are produced. If the water stops flowing altogether, this may be due to the impaction of a fecal plug in the opening of the tube or to knuckling of the catheter; in either case the tube should be withdrawn a few inches. If the flow does not start again, then the catheter must be entirely withdrawn, cleansed and reinserted.

Irrigating fluids

For the purpose of colonic flushing, pure water, normal salt solution 6 to 8 to 1000, soapy water or water medicated with a tablespoonful of glycerin to the quart, or with certain laxative, disinfectant or astringent remedies (see page 420), may be used. In some cases in which there is much impaction of hard fecal material in the lower bowel, a preliminary injection of six to eight ounces of olive oil may be practised in order to promote softening of the contents of the large intestine.

Rest of the bowel

After removal of the poisonous and irritating bowel contents by calomel or castor oil and by rectal irrigation, the next most important rule is to place the bowel wall at rest, to spare the intestinal mucosa in order to allow the undisturbed re-establishment of normal conditions.

Diet

Abstinence

Thirst

In order to do this, the following dietetic rules should be observed: During the first twenty-four hours complete abstinence from food is the best plan, and this treatment can usually be carried out without difficulty because the patients spontaneously refuse to eat. The severe thirst that suffererers from acute intestinal catarrh usually experience during the first twenty-four hours can be relieved by small swallows of sterile water or tea, or by allowing the patient to dissolve pieces of ice in the mouth. Chewing gum is also an efficient means to relieve the sensation of thirst. Inasmuch as sufficient liquid to satisfy the water requirements of the organism cannot and should not be supplied in this way, irrigation of the colon with normal salt solution may aid in supplying this deficit.

Water by rectum

Gruels

Albumen water

In very mild cases a little gruel or soup made of oatmeal, rice or barley flour, sago, arrow-root or tapioca and water, carefully strained and flavored with a little salt or a little meat extract, may be allowed on the first day, in tablespoonful doses. In all cases this diet is permissible on the second day. In addition, the patients may receive a little albumen water or egg-nog made of the whites alone; a little Claret or brandy diluted with boiled water, or weak tea should constitute the chief beverages on the second day.

Milk

Milk is well borne by some subjects and not at all by others. It should never be given raw in cases of acute intestinal catarrh, but only boiled or carefully sterilized, never cold and never too hot, but only lukewarm in small quantities at a time and best with a tablespoonful of lime water or a teaspoonful or two of brandy to the tumblerful. If milk increases the diarrhea, then buttermilk or kumyss or kephyr, administered in tablespoon doses, may be tried. The nourishing character of these milk preparations renders them very useful provided they can be borne.

Diet after the third day

On the third day it is permissible to add a little toast, zwieback or crackers to the above dietary. In addition, meat broths with an egg, or some cocoa may be given. This simple, semi-liquid diet should be continued until the diarrheic discharges have stopped; then a little raw, scraped meat or broiled beef or mutton may be given, also squab or some white meat of chicken, meat jelly, gelatinous food, a little rice or tapioca, some vegetable purées and mashed potatoes.

Food to be avoided

All fried foods, foods prepared with much fat, fresh fruit, acid or spiced foods, very hot or very cold foods should be avoided for some days after the diarrhea has stopped.

Drugs

Intestinal antiseptics

Calomel

Dilute H Cl

Resorcin
Menthol
Creosote
Salicylic acid
Salol
Beta-naphthol
Benzo-naphthol

Special medicines are rarely required in the treatment of acute intestinal catarrh. Certain of the group of intestinal antiseptics may be employed to hold the development of the bacterial flora in the intestine in check. The use of some of the intestinal antiseptics, sodium glycocholate, organic peroxides and sulpho-carbolates has already been fully discussed in the Section on *Bright's Disease*, page 207. Other intestinal antiseptics that can be used are calomel in very small doses, i. e., a twentieth to a tenth of a grain, two or three times a day. In this dose calomel does not irritate the bowel wall nor does it purge, but merely inhibits bacterial life. Dilute hydrochloric acid in five to ten drop doses may be given for a similar purpose. The following remedies may all be tried: Resorcin in five per cent. solution, three to five teaspoonfuls a day; menthol, two grains (0.12 gm.) two or three times a day; creasote, one to three drops (0.06 to 0.18 gm.) in brandy or wine several times a day or in olive oil, in gelatin capsules or in solution with some simple syrup; salicylic acid, five to thirty grains (0.3 to 2 gm.) in capsule or in solution; salol, in the same dose; naphthaline, one to five grains (0.06 to 0.3 gm.); beta-naphthol, three to ten grains (0.2 to 0.6 gm.); benzo-naphthol, five to ten grains (0.3 to 0.6 gm.).

Danger of metallic antiseptics

In acute intestinal catarrh particular care should be exercised to avoid the administration of intestinal antiseptics that are irritating to the bowel wall; thus most of the metallic salts with antiseptic properties, with the exception of calomel given as above, should be eschewed. A very useful preparation is ichthoform, a combination of formaldehyde and ichthyol, which splits off formaldehyde in the intestine. It should be given in two to three grain doses, twice or three times a day.

Ichthoform

Many of the above intestinal antiseptics can to advantage be given in keratinized pills or glutoid (Sahli) capsules, i. e., capsules, made of gelatin hardened with formaldehyde or, also, in pills coated with salol; in this way they pass through the stomach unchanged and exercise their full effect in the bowel.

Administration in keratinized pills or glutoid capsules

Astringent remedies are not often indicated in acute catarrh of the bowel. They should never be used during the first two or three days. If the diarrhea persists for many days uninfluenced by other measures, then some of the astringent group of medicines may have to be employed. They will be discussed in full in the Section on *Chronic Intestinal Catarrh.*

Astringents

Narcotics are generally superfluous. If there is much pain and if the diarrhea persists, despite the complete evacuation of the irritating bowel contents by calomel or castor oil and by intestinal irrigation, then opium or morphine may have to be resorted to. Opiates stimulate the nerves that inhibit intestinal peristalsis, i. e., check the latter. They also render the sensory nerve endings in the bowel less sensitive to irritation by bowel poisons and thereby also aid in arresting peristalsis. The best mode of administering opiates is either in suppository with belladonna (of each extract ½ grain), or in the dose of fifteen to twenty drops of the tincture of opium as an enema in starch water (two teaspoonfuls of starch flour in eight ounces of water). If there is much gastric or rectal irritation, so that the administration of opium by mouth or rectum is disagreeable then morphine in one-sixteenth or one-eighth grain doses may be given hypodermically.

Narcotics

The constipation following the use of opiates, as well as the constipation that generally follows the diarrhea in acute intestinal catarrh, calls for no special treatment. It may be allowed to persist for several days after the diarrhea is checked and should then, if necessary, be relieved by enemas and by the proper diet (see Section on *Constipation*).

Constipation following opiates or diarrhea

Heat applied to the abdomen in the form of hot water bags, poultices, hot compresses or dry, hot cloths is always grateful to those afflicted with acute intestinal catarrh and materially aids in reducing the colicky pain. If there is much flatulency, turpentine stupes (cloths wrung out of hot water medicated with two or three drops of oil of turpentine) or enemata medicated with two or three drops of turpentine or with carminative remedies are useful (see also Section on *Meteorism*).

Heat

Stupes

If there is fever rest in bed should be enforced. Cases of

Fever

acute intestinal catarrh that manifestly follow exposure to cold, should be given a hot bath, wrapped in blankets and allowed to sweat. Drop doses of the tincture of aconite repeated four or five times, at hour intervals, or a ten grain Dover's powder, given in the beginning, often aid in shortening the attack. That the other measures described for the treatment of acute intestinal catarrh should be employed in addition, is self-evident.

Analeptics

In cases that go into collapse analeptic remedies like camphor, ether or ammonia (see page 32) should be administered. Hot alcoholic drinks should be taken, hot water bags or bottles put to the feet and legs, the extremities rubbed with rough towels, and the patient wrapped in woolen blankets with an ice bag to the head.

CHRONIC INTESTINAL CATARRH.

General indidications

In no case of chronic intestinal catarrh is it possible by any known means to directly influence the diseased condition of the intestinal mucosa. All one can do is to avoid further irritation of the inflamed area by the selection of the proper food and by the administration of drugs that prevent the formation of irritating products in the bowel and their stagnation in intimate contact with the catarrhal lining membrane of the intestine. At the same time general hygienic means may be employed intended to improve the general health and nutrition of the patient and thus enable him to put forward the maximum effort towards restoration of tissue integrity.

Diet

The diet, above all, in chronic intestinal catarrh, as in any other chronic disorder, should be nutritious enough to satisfy the daily caloric requirements of the individual. The ingestion of sufficient calories is often a difficult task owing to the existence of diarrhea with loss of valuable pabulum in the stools, and also on account of the presence of chronic catarrhal changes in the intestinal mucosa which interfere with the proper intestinal digestion and hence render only part of the ingested food available for the nutrition of the patient.

General character of diet

Forbidden foods

Generally speaking the diet, aside from being nutritious, should also be non-irritating to the bowel wall, i. e., it should contain no coarse or indigestible particles, no spices, condiments, no very acid, very sweet or very fat foods of any kind. Fruits and salads are forbidden.

In selecting a general dietary from permitted articles, the individual likes and dislikes of the patient must be considered. In so prolonged a disorder as chronic intestinal catarrh it is worse than useless to force the patients to eat articles of food that they thoroughly dislike. On the other hand to be too arbitrary in absolutely forbidding small quantities of articles of food that theoretically might be harmful, but that the patients crave, is also bad practice. The stimulation of the appetite above all is an important element in aiding digestion and in maintaining the nutrition of the patient.

Analysis of stools as index for the dietary

The main index, however, that teaches whether or not an article is well borne and properly digested is an analysis of the stools. A study of the feces after various "test meals" is of equal importance here as the analysis of the stomach contents in stomach disorders. Whenever an article, that, on theoretical grounds, is indicated and permissible, persistently reappears in the stools in a semi-digested or undigested form, then its further administration becomes worse than useless; for not only does it not contribute to the patient's support, but it positively aggravates the catarrhal condition of the intestinal mucosa by its action as a mechanical or chemical irritant throughout the length of the intestinal canal.

Useful and permissible foods

Meats

Eggs

Gruels

Milk

The following articles, with the above reservations, are the most useful in chronic intestinal catarrh: All meats of tender varieties, especially white meats, fish and poultry, always finely divided and freed from skin and tendon; meat jellies (see page 536), gelatinous foods, meat broths; eggs should be given only soft boiled, scrambled and prepared with very little fat. Gruels made with water or milk and tapioca, sago, arrow-root, rice, barley flour, etc., are useful. Milk is usually well borne in chronic intestinal catarrh even when administered in large quantities, provided it is altogether fresh, otherwise it may become troublesome. It is always safer to administer it boiled or carefully sterilized than raw. The digestibility of milk, as repeatedly stated, may be increased by the addition of lime water or of a little brandy. Kephyr, kumyss and buttermilk are also allowed. The lactic acid contained in these beverages acts, to some extent, as an intestinal antiseptic and may be useful on these grounds. Cereals and bread stuffs, noodles, macaroni and other dishes made of flour are permissible, provided they are not prepared with too much fat. Of breads, sour and coarse kinds should never be given, but chiefly dried bread, toast, crackers, zwieback. The fat demand may be supplied by fresh butter and cream, and vegetable oils; meat fats, like lard, suet and bacon are not so well borne.

Buttermilk

Kephyr

Kumyss

Cereals and bread stuffs

Fats

Beverages

Of beverages, boiled water, sterile milk, a little dilute Claret or Moselle wine or whisky and water, mineral waters that have been shaken in order to cause the evaporation of carbonic acid gas, tea and cocoa are all allowable. Beer, champagne, strong alcoholic liquors and coffee are to be denied.

Diet in constipation

Diet in diarrhea

In cases of chronic intestinal catarrh accompanied by very obstinate constipation, a little more of cereals and fats, of fresh vegetables, even of fruits, may have to be given. In cases, on the other hand, that suffer from diarrhea more meat and milk and less of the above articles should be administered.

Small meals

Small meals at frequent intervals are always better than large meals. The patients should be instructed to eat very slowly and to thoroughly masticate their food. If at all possible they should be instructed to lie down or to rest quietly for from half an hour to an hour after the main midday and evening meals.

Drugs

Tannic acid

Tannigen
Tannalbin

Catechu
Rhatany
Colombo
Kino

For the purpose of inhibiting abnormal fermentative processes in the bowel a variety of medicines are used; chief among these are tannic acid preparations, especially in that large group of cases of chronic intestinal catarrh that suffer from persistent diarrhea. The members of the tannic acid group are credited with "astringent" properties. As a matter of fact they aid chiefly by stopping putrefaction of bowel contents. The best tannic acid preparations in chronic intestinal catarrh are tannigen and tannalbin; for neither of these drugs is attacked by the gastric juice, so that the tannin they contain really exercises its full effect upon the bowel contents. Tannic acid, itself, and preparations of catechu, rhatany, colombo, kino, etc., that all contain some tannic acid, may all be used in the diarrhea of chronic intestinal catarrh (usually in combination with opium) to check fermentation, but they are not without effect on the stomach, and, besides, a large part of the tannin is absorbed in the stomach and hence does not become available for use in the bowel. Tannalbin, however, an albumin compound of tannin, containing about five per cent. of the latter and rendered resistent to peptic digestion by heating to 120° C., enters the bowel unchanged and is there split up by the alkaline intestinal juices. Tannigen (diacetyl tannic acid) possesses similar properties. Each of these remedies should be given in ten to thirty grain (0.6 to 2 gm.) doses several times a day, in powder form.

Bismuth preparations

Next in importance to tannic acid preparations in the treatment of diarrhea due to chronic intestinal catarrh are a variety of bismuth preparations. The exact mode of action of bismuth in these cases is not altogether understood. It is probable that it acts mechanically by forming a coating over the inflamed mucosa and thereby protects it against irritating bowel contents. Bismuth, in order to be effective, should be given in large quantities, either as the subnitrate or as the subsalicylate in doses of fifteen to thirty grains (1 to 2 gm.) in powder, three

Dermatol

Xeroform

or four times a day. Both these bismuth preparations can, to advantage, be given together with a little extract of opium. Two other good preparations of bismuth are dermatol given in the dose of one and a half to three grains ((0.1 to 0.2 gm.) and xeroform[*] in the dose of fifteen to sixty grains (1 to 4 gm.). Both of these preparations are split up in the bowel into bismuth and tannic acid, in the case of dermatol; or an aromatic antiseptic radical in the case of xeroform, so that they combine the mechanical action of bismuth with the antiseptic action of the tannin and phenyl derivative they incorporate.

Metallic salts

Silver nitrate

The administration of other metallic salts, lead acetate, zinc suphate, alum, or silver nitrate is not so common nowadays as it used to be. These remedies are all quite irritating to the bowel wall and the stomach, and as it is most important to prevent injury to the gastric wall in chronic catarrh of the intestine, the use of all these drugs must be considered somewhat precarious. The advantages derived from their antiseptic action are more than overbalanced by their irritating effect. The least harmful of all this group of medicines is silver nitrate, which is promptly converted into silver chloride and silver proteid compounds in the stomach, both substances that possess only slight irritating powers, but very powerful germicidal properties. Silver nitrate should be given in dessertspoonful doses of a 1:100 solution, three or four times a day.

Castor oil

In addition to the administration of antiseptics and astringents by mouth, free evacuation of the bowel should be promoted, especially in all cases of chronic intestinal catarrh accompanied by constipation; an occasional dose of castor oil in combination with an enema is, therefore, of benefit in these cases; or a variety of mineral waters may be employed.

Mineral waters

Alkaline-saline (Carlsbad, Vichy, Marienbad) waters

Just how mineral waters act in chronic intestinal catarrh is not understood. Empirically it is universally recognized that they favorably influence not only symptoms like constipation or diarrhea, but that they materially aid in restoring normal conditions about the bowel mucosa. That this good effect is not due alone to life at a resort where these waters are taken, or to rest and the proper regime that is carried out in these watering places, is shown by the benefits accruing to sufferers from chronic intestinal catarrh from the use of these waters at home. Alkaline and saline waters are the best, chief among them the waters of Carlsbad, Vichy, Marienbad. They should be taken hot, a tumblerful on rising, another one in the middle of the forenoon and a third in the middle of the afternoon. The water should always be taken slowly in small swallows. Some patients cannot tolerate these waters on an empty stomach and they fare better if they take their first glass after breakfast. Waters of this type are most effective in cases of chronic intestinal catarrh associated with diarrhea.

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[*] To the same group of aromatic bismuth compounds belong eudoxin, orphol, dermol, bismuth sulpho-carbolate, -cresolate and -phenolate.

Sulpho-saline waters

If there is much constipation, or if constipation and diarrhea alternate, then the sulpho-saline waters, or waters containing Glauber salts, are best. These should be taken cold and the quantity administered should be gauged by the action of the bowels. The proper quantity is enough to produce free daily evacuations. These waters, too, are best given after a meal and not on an empty stomach. In order to be effective these mineral water "cures" should be kept up for long periods of time, i. e., their use should be continued at home and not only at the watering places for a few weeks once or twice a year.

Colonic flushings

Colonic flushings and rectal irrigation are useful adjuvants to the treatment. In performing irrigation of the rectum and colon, either simple warm water or normal salt solution may be used. As a rule water of body temperature is the best. If, however, there is very much pain or irritation about the lower bowel, then hot irrigations of 105° to 110° F. are more grateful to the patient. Of antiseptics and astringents that may be employed to medicate the irrigating water, tannin, 5:1000; silver nitrate 0.5:1000; salicylic acid, 1:1000; boric acid, 5:100; and creoline, 1:1000, may be mentioned. Injections of 500 to 1000 cc. of olive oil, warm, are also very useful.

Opium in the diarrhea of chronic intestinal catarrh

Opium preparations should be given with care in the diarrhea of chronic intestinal catarrh, and only as a last resort in order to secure symptomatic relief from pain and to stop persistent diarrhea that will not yield to any of the other measures spoken of above. The danger of opium treatment lies in this, that the drug by checking intestinal peristalsis favors stagnation of fermenting bowel contents, and hence may increase the bowel irritation. In view of the slightly irritating effect that opium occasionally exercises upon the gastric mucosa the drug is best given in the form of suppositories or hypodermically, either alone or in combination with belladonna (see page 409), or in combination with some of the above mentioned astringent and antiseptic remedies.

Hydrotherapy

Hydrotherapeutic measures are of subordinate importance in the treatment of chronic intestinal catarrh. Priessnitz compresses applied to the abdomen are, however, useful and generally agreeable to the patient. If there is much diarrhea with violent peristalsis and considerable irritation of the bowel and pain, a Winternitz compress (see page 411), or hot turpentine stupes are very useful. In obstinate constipation on the other hand sitz baths, cold douches, Scottish douches, are often of great benefit. The latter measures with exact indications for their employment and the technique of applying them will be found described in full in the Sections on *Diarrhea* and *Constipation*.

Rest and exercise

A patient suffering from chronic intestinal catarrh, especially with acute exacerbations, with persistent diarrhea, pain and tenesmus, should remain in bed until the attacks of diarrhea are checked or greatly reduced. Cases of chronic intestinal catarrh with chronic constipation, on the other hand, should indulge in a mild amount of exercise. No fixed rules in regard to rest and exercise can be formulated but the peculiarities of each individual case must be studied and rules made accordingly.

Clothing and footwear

The clothing and footwear should be carefully selected to protect the patient from catching cold. In winter woolen underwear and stockings and thick shoes should always be worn. An abdominal binder made of flannel or wool should be worn all the year round. During the warm weather a hardening process may be begun and carried on into the winter, as described in the Section on *Rhinitis*.

INTESTINAL STENOSIS AND OCCLUSION

Surgical vs. internal treatment

Most cases of occlusion of the bowel, immaterial whether they develop independently and suddenly or whether they develop less acutely on the basis of chronic stenosis of the bowel that gradually progresses to complete obliteration of the bowel lumen, are amenable to surgical treatment alone. Not infrequently, however, a case will be encountered in which a restoration to normal conditions is produced by internal treatment. Such cases, in the very nature of things, are rare and constitute probably not one-third of all intestinal occlusions that are seen. This happy outcome manifestly can only occur under certain definite anatomic conditions to be specified below, whereas, in the majority of cases, the obturation of the bowel is of such a mechanical character that it can only be relieved by radical, mechanical, i. e., surgical, means.

Indications for surgical or medical treatment

It will be seen, therefore, that the indications for internal or for surgical intervention are dependent altogether upon the nature of the occlusion; and, as it is in most cases impossible to make an altogether positive diagnosis in this direction, internal treatment should only be employed tentatively and never for longer than forty-eight hours after the onset of the first symptoms of bowel occlusion. If at the end of this time patency of the bowel lumen is not re-established, recourse should be had to surgery. The different internal measures, to be presently described, should, therefore, be tried quickly and in rapid succession in the hope that one or the other of them may lead to the goal and obviate the necessity of a laparotomy.

The following forms of bowel occlusion occasionally yield to internal treatment:

Fecal obstruction

Above all, fecal obstruction, i. e., occlusion of the bowel by a plug of fecal matter occurring either as the result of obstinate constipation and coprostasis, in an otherwise patent canal, or occurring on the basis of a chronic narrowing of the lumen of the bowel by cicatricial stenosis or neoplastic growth from within, or by compression of the bowel from without by some enlarged or dislocated organ, by peritoneal adhesions or thickening of the bowel wall. In the latter category of cases removal of the fecal obturator which may be very small or may consist merely of some coarse or indigested food particle, is, however, more difficult than in simple fecal stasis. Occlusion of the bowel lumen by a large gall stone or some other foreign body is also amenable to internal treatment in a certain proportion of cases. Here, too, the presence or absence of chronic stenosis determines to a large extent the facility with which the obturator may be expected to pass on and out under appropriate medical treatment. The obstruction is (self-evidently) removed much more rapidly if the bowel lumen is normal throughout its course than if it is constricted or stenosed in some portion. Here the previous history of the case, the existence of stenosis symptoms prior to the occurrence of the occlusion, must, to a large degree, determine the treatment.

Gall stone occlusion

Occlusion from pressure from without

Occlusion of the bowel by pressure from without, especially by compression of the bowel by large movable organs or tumors adjacent to the bowel, may yield to bandaging and manipulation and to placing the patient in certain positions in which the large abdominal mass that produces the compression is held away from the bowel. In this group such non-surgical treatment is, however, purely palliative and in most instances merely preliminary to an operation.

Intussusception

Intussusception of the bowel also occasionally yields to internal treatment (opium, atropine, lavage, irrigation,—see below); most cases, however, do not. An attempt to relieve the obstruction by non-surgical means should, therefore, always be made in these cases, but one should never persist in this treatment for longer than forty-eight hours at the utmost. Upon the appearance of collapse symptoms, or evidence of an impaired heart's action (see below), recourse should at once be had to surgical means

Volvulus kinks

The same rules, provided the diagnosis can be made at all, apply to volvulus and slight kinks of the bowel, although here the probability of restoring bowel patency by internal treatment is even smaller than in the case of intussusception.

Strangulation
Knotting
Axial rotation

All the other forms of bowel occlusion, namely, firm strangulations, either internal or external, severe kinking or knotting of the bowel, double axial rotation, are surgical altogether from their onset and to waste time with internal measures in the treatment of these forms of ileus is bad practice.

Indications for instituting preliminary medical treatment

Even in the first named group of cases that may be said to occupy a position on the borderland between surgery and medicine, a variety of elements about the general condition of the patient must determine the advisibility of trying non-surgical means first, or of having recourse at once to operative interference.

The considerations that should govern us in instituting preliminary internal treatment are the following: The method of treating any cases of internal occlusion by medical means, i. e., of adopting an expectant plan, is justified by the fact that about one-third of the cases recover without an operation. Of this group by far the greatest number, it is true, are due to fecal obstruction. Some clinicians claim, furthermore, that to wait is always good practice, because repeated examinations of the patient will enable the physician to make a better diagnosis, to localize the seat of the obstruction and hence formulate more clean cut indications for surgical intervention. As a matter of fact I have never found this to be the case; for if the tumor or swelling in the abdomen cannot be found on first examination, it is usually still more difficult to find it later in the course of the disease, on account of the meteorism and the muscular rigidity that generally develop within twenty-four hours and renders the palpation of the abdomen much more difficult than in the beginning, even if an anesthetic is given.

Arguments against the expectant plan

As against the expectant plan surgeons advance the just argument based on conservative statistics that the mortality from an operation in this disorder increases in proportion to the length of time that is permitted to elapse between the onset of occlusion symptoms and the operation. They argue, furthermore, with some justice, that internal treatment, especially the use of opium and the reduction of the intra-abdominal pressure by lavage or colonic irrigation, produces a sense of euthanasia, relieves the patient's distress and hence engenders a false sense of security in the patient, the friends and the physician; furthermore, raises false hopes that are apt to be shattered; and above all, favors loss of valuable time during which the intra-abdominal conditions are really being aggravated and the chances of recovery from surgical intervention are being reduced.

Critique of above arguments

All these arguments, pro and con, would, it appears, speak directly for surgery in every case of bowel obstruction. Unfortunately, however, operative interference, even in the most skillful hands, is always dangerous in this disease, probably less safe than laparotomy performed for almost any other acute intra-abdominal disorder. This is due to the peculiar conditions created by intestinal occlusion, the necessity in most cases of exploring large areas of the abdomen and of submitting many feet of the intestine to manual examination; the existence of meteorism with bowel distention, possibly paralysis of the bowel wall and, above all, in many cases, ulceration and great friability of the intestine. In most cases, in fact, the operation will have to partake of the character of an exploratory laparotomy and often the surgeon will have to content himself with establishing an artificial anus or performing a simple enterotomy, reserving the radical operation for a second occasion, provided the patient should be so fortunate as to survive the shock of the first emergency inroad. Cases in which the exact location of the occlusion and its precise character are known before the operation, or in which the occluded area is quickly found after laparotomy, are unfortunately relatively rare and even in these the success of the operation is of necessity doubtful, as everything depends upon the mechanical conditions discovered and the possibility of relieving them promptly by surgery.

Surgery is, therefore, by no means the panacea for occlusion of the bowel that one might imagine it to be. There are cases in which it is our only means of succor, but there are also many cases in which surgery, as well as medicine, is helpless, and there are still other cases, constituting, as stated above, about one-third, in which the patients get well without an operation. A conservative expectant plan with the adoption of all the non-surgical means we know of is, therefore, justified in the large class of cases delineated above, provided, of course, the patient is carefully watched during this time and everything is held in readiness for the operation should the necessity for it suddenly arise.

The heart's action

So long as the heart's action is good, i. e., while the arterial tension is normal or slightly elevated, the pulse full, strong and of moderate rapidity; so long as no symptoms of acute strangulation or collapse (cold sweats, cyanosis, cold extremities, etc.) appear, it is generally safe to rapidly try all the non-surgical means. As soon as the heart begins to fail, the pulse becomes small, rapid and thready, the blood pressure low; if collapse occurs or signs of peritonitis or perforation develop, then no time should be lost in placing the patient on the operating table.

Collapse

The existence of collapse symptoms, appearing even one or two days after the onset of occlusion, or collapse occurring from the initial shock of the occlusion, cannot be considered a contra-indication to surgical intervention; for without the operation these patients will surely die and with the aid of surgery they have at least a chance of recovery. Peritonitis or perforation do not prohibit a laparotomy; for in the light of modern surgical experience an occasional case of localized, even of mildly diffused peritonitis, unless too horribly septic, recovers after laparotomy.

The means of the internist

The internist has a number of means at his disposal for overcoming intestinal obstruction, chief among them lavage of the stomach, irrigation of the lower bowel, inflation of the rectum and colon with water or carbonic acid gas, the use of laxatives in some cases, of opium in others, massage, counter-irritation by means of heat or cold. The employment of mercury that was formerly so popular in ileus is being discarded nowadays as useless and occasionally harmful.

The use of mercury obsolete

For the application of all these measures distinct indications and contra-indications exist in the different forms of intestinal occlusion that may now be discussed.

Lavage

Lavage of the stomach and removal of the stomach contents, which is generally abundant and frequently contains fecal material, acts favorably in three ways, viz:

First, lavage reduces the intra-abdominal pressure and hence greatly relieves the most distressing symptoms, especially vomiting and flatulency; at the same time it decreases the violence of peristaltic movements and favors the straightening of kinked or twisted bowel loops.

Second, lavage causes removal of a mass of toxic material accumulating in the stomach that may do serious harm by producing general symptoms of toxemia, especially about the heart and nervous system, if allowed to remain behind or if only incompletely evacuated by spontaneous vomiting.

Third, lavage in many cases, materially aids in the evacuation of the bowel contents above the constricted area; for as soon as the stomach is thoroughly emptied by lavage, regurgitation of bowel contents into the stomach occurs, so that within a few hours the stomach will generally be found full again. In some cases during the performance of lavage new masses of fecal matter will suddenly appear in the stomach even after the wash waters were already clear, showing how rapidly bowel contents in this condition can regurgitate into the stomach.

Time of performing lavage

It is obvious, therefore, that in cases of bowel occlusion lavage of the stomach should be performed repeatedly and at short intervals. It is always good treatment to wash out the stomach at two or three hour intervals until nothing more of fecal material can be pumped out. It is unnecessary to wait for fecal vomiting before performing lavage, as removal of the stomach contents, even if it is not contaminated with bowel contents, is good practice on account of the reduction of the intra-abdominal pressure and the removal of toxic stagnating material that is thereby brought about. Moreover, the stomach may contain abundant fecal material and still no fecal vomiting occur.

Contra-indication

The one contra-indication to gastric lavage is severe collapse.

In cases that are distinctly surgical in character and in which an operation has been decided upon, gastric lavage is also of signal benefit; for it is manifestly easier to manipulate the bowel after laparotomy if the stomach is small and empty than if it is large, heavy and distended, and occupies a large space in the abdomen; besides the danger of vomiting under an anesthetic and the occurrence of pneumonia from aspiration of foul vomited material is greatly reduced if lavage of the stomach is performed as a preliminary to the operation.

Bowel irrigation

Bowel irrigation is always of value in intestinal occlusion. In ileus, due to fecal obturation, it is, of course, the sovereign remedy. It is generally of use in impaction of a gall stone or of some other foreign body. In occlusion of the colon it is self-evidently of value, immaterial whether the occlusion is due to the impaction of a fecal plug in a chronically stenosed, constricted area of the colon, or whether the ileus is due to invagination with the abdominal mesentery. In most cases irrigation of the lower bowel acts mechanically by softening and removing the fecal plug or loosening the impacted foreign body. In invagination the use of an eight to ten per cent. salt solution (see below) by producing anti-peristaltic waves may even act directly curatively; for as soon as the anti-peristaltic waves reach the invaginated area the obstruction may disappear. In kinks or twists of the sigmoid flexure irrigation helps both by removing heavy, dragging fecal masses and by producing stretching and straightening of the affected bowel section; and, even in ileus in the small intestine, the peristaltic and anti-peristaltic waves that are stimulated may be of signal benefit in promoting restoration of bowel patency.

Contra-indications

There are distinct contra-indications to the use of rectal or colonic irrigation, namely, ulceration or great friability of the bowel wall that may be suspected and feared in a variety of disorders that produce intestinal occlusion. It is also clear that rectal irrigation should not be repeated if, in a given case, the first enema does not promptly return, or if the patient is altogether unable to retain the injected fluid. In some cases irrigation of the bowel becomes impossible on account of the presence of large, hard masses of impacted feces in the rectum or lower bowel. Here an attempt should always be made to soften the latter by the injection of small quantities of oil or, if necessary, to remove them mechanically with a blunt spoon or some other instrument.

Solutions to be employed

The technique of rectal irrigations and of colonic flushings has already been described (see page 422). The best irrigation fluid in ileus is a ten per cent. solution of sodium chloride in water. Salt solutions of this concentration produce anti-peristaltic waves so that the water is often carried up as far as the lower portion of the ileum. One other great advantage of these strong salt enemata is that only small quantities, i. e., from 300 to 400 cc. need be injected in order to produce the same effect, or even a greater one, than would ordinarily be produced by the introduction of several litres of any other injection fluid. By using these strong salt enemata, therefore, the increase of the intra-abdominal tension and excessive stretching or distention of the bowel is avoided. The addition of a few ounces of infusion of senna, or of some other laxative infusion to the salt clysma, can do no harm, but is, as a rule, superfluous.

Strong salt enemata

Cold enemata

The use of cold enemata or of ice water given for the purpose of stimulating peristalsis is always dangerous, especially in cases threatened with collapse or actually in collapse. This measure is unnecessarily severe and in view of the diagnostic uncertainties obtaining in each case of bowel occlusion, and the inability to predict in advance whether or not stimulation of peristalsis is desirable (see below), it is sometimes decidedly precarious. Small clysmata of warm water or of physiological salt solution are much better. They should be injected very slowly in order to avoid over-distention of the bowel. Rectal irrigation should be performed at intervals of three or four hours until the bowel passage is cleared or the time for operation has arrived.

Oil injections

Injections of one-half to one litre of lukewarm olive oil can always be given with safety as a preliminary measure. They are very useful to soften and dissolve hardened fecal masses or to loosen a fecal plug and to render the way open for the passage of after-coming bowel movements.

Air inflation

Inflation of the lower bowel with air or carbonic acid gas possesses no particular advantages, so far as its mechanical effect is concerned, over the injections of water, oil or salt solutions; as the latter, aside from distending the bowel, aid in cleaning out the intestine, they are by all means preferable. Following a series of fluid injections an air or carbonic acid gas inflation may, however, be practised to advantage, especially as this method of distending and stretching the lower bowel is often better borne and less distressing to the patient than distention with the heavier fluid irrigations. Inflation, too, is particularly useful in invagination and in kinks or partial rotation of the sigmoid flexure. The same contra-indications to the use of air and gas inflation exist as in the case of water injections, namely, friability of the bowel wall and ulceration, provided the existence of these conditions can be determined, or is even strongly suspected.

Technique of inflation

To perform inflation of the rectum and colon with air a rectal tube is joined by a T tube with an air bulb. The free limb of the T tube is connected with a piece of rubber tubing held shut with a clamp. When it is desired to allow the escape of air from the rectum, this clamp is opened. To inflate the rectum with carbonic acid gas the rectal tube may be connected with an ordinary siphon and carbonated water injected into the bowel, or a watery solution of bicarbonate of soda is injected first and a solution of tartaric acid immediately afterwards. Of the former, twenty grammes, of the latter, fifteen grammes are commonly used.

Opium

A violent controversy has been going on for many years between physicians and surgeons in regard to the administration of opium in occlusion of the bowel. Internists generally advise its use in all cases as a routine measure in the beginning of the disease. Surgeons, on the other hand, condemn its employment, claiming as stated above, that it produces merely a sense of euphoria, lulls the medical attendant into a sense of false security, permits aggravation of the bowel condition and favors waste of valuable time before the operation is finally performed.

Objections to opium

Rationale of opium

Inasmuch, however, as opium certainly relieves the suffering of the patients and in some cases, by reducing peristaltic movements, directly aids in restoring normal conditions, its use during the first twenty-four hours is indicated and can be advised. If, at the end of this time, the bowel lumen is not open, the surgeon in any doubtful case comes into his right anyhow, and so much at least has been gained by the administration of opium that the patients remained relatively comfortable during the time that internal treatment was administered. That severe collapse symptoms from reflex irritation emanating from the bowel and peritoneum are often prevented and that the section of bowel immediately above the obstruction is not so unduly stretched and injured by continuous packing of bowel contents into this area, when opium has been given to allay the violent peristaltic movements of the bowel, must be conceded. Even in those cases, finally, that are surgical from their onset, opium can do no harm. On the contrary it usually does good by preventing collapse, by quieting the general sensibilities and nervousness of the patient and also by reducing the violence of peristalsis. The surgeon's plea against opium, provided the drug is given only during the first twenty-four or forty-eight hours, cannot, therefore, be considered valid.

To summarize, opium is permissible in all cases of intestinal occlusion. In cases that are clearly surgical from their onset (and to know this is one of the most difficult and uncertain tasks of diagnosis) the drug can do no harm when given as a preliminary to the operation. In cases in which the diagnosis is altogether doubtful opium should be given for twenty-four to forty-eight hours, first, for the purpose of relieving the patient's anxiety and restlessness, and to allay the vomiting and mitigate the terrific pain; second, for counteracting the sudden, early collapse from reflex irritation emanating from the sensory nerves of the intestinal peritoneum; third, for reducing the over-violent intestinal peristalsis and hence preventing to some extent, damaging paralysis, ulceration or perforation in the bowel area situated immediately above the obstruction. In certain forms of intestinal occlusion, finally, chiefly invagination, volvulus or slight degrees of kinking or twisting of the bowel, the arrest of peristalsis that is brought about by opium, combined with other measures (lavage, irrigation, etc.), may even aid in restoring normal conditions.

Dose and administration

In order to be effective large doses of the drug should be given early in the disease. As the absorptive powers of the stomach are usually greatly reduced or inhibited in occlusion of the bowel and as opium, moreover, is a distinct irritant to the gastric mucosa and may precipitate vomiting, it is best administered not by mouth but in suppository or hypodermically. The exact dosage depends somewhat on the reaction of the individual to the opiate. The proper dose in any case is enough to produce the desired effect. It is best given in amounts of half a grain (0.03 gm.) of the extract, every one or two hours, in suppository or in the form of a watery solution of the extract of the strength of 1:10. Of the latter, an amount corresponding to about a third of a grain (0.02 gm.) should be injected every two hours until the desired effect is produced; or morphine should be injected in the dose of an eighth to a fourth of a grain, every two or three hours, until the patient is clearly under the influence of the drug.

If the rule is observed not to rely upon opium for longer than forty-eight hours in cases in which the bowel lumen is not reopened by that time, no harm can be done and the most serious objection against its use, namely, production of a false sense of security, is rendered invalid. After forty-eight hours have elapsed the administration of opium is unnecessary unless the drug is given for purposes of euthanasia in cases in which an operation cannot be performed. Above all things, it is important to remember that the relative comfort of the patient when under the influence of opium should never constitute a contra-indication to an operation. The only criterion that should guide the internist in advising an operation is whether or not the bowel is open at the expiration of forty-eight hours; for, while some cases have been known to live for many days with complete occlusion of the bowel, this event is exceptional.

Opium in collapse

Whereas opium may be considered an efficient remedy to prevent the occurrence of collapse early in occlusion of the bowel, it should be given with great care in collapse occurring later, i. e., after the expiration of twenty-four or forty-eight hours, an accident that is especially liable to happen in cases that have not had the benefit of opium treatment from the beginning. To give large doses of opium suddenly in these instances is a precarious matter; for the weak heart, the peripheral cyanosis, the cold extremities, the rapid, thready pulse constitute direct contra-indications to the use of the drug. If, in such patients, it becomes necessary on account of the great pain to give opium or morphine, then these drugs should, by all means, be administered in combination with some analeptic like ether, camphor or ammonia to support the heart.

Atropine

Atropine should be given with the same reservations as opium. No time should be wasted with atropine treatment in clearly operative cases, nor should its use ever be continued for more than two days. Any patient with occlusion of the bowel who is treated with atropine should be carefully watched and if resolution does not promptly occur, recourse should be had to an operation. It is known empirically that atropine is occasionally highly effective in causing reopening of the bowel lumen. All the favorable cases, however, were presumably due to fecal obstruction or occlusion of the bowel by a large gall stone or other foreign body, or cases of "dynamic" ileus. In view of the difficulty of diagnosing the precise character of the occlusion, it is clear that too much reliance should never be placed upon atropine, especially as its mode of action in these cases is very obscure. It is doubtful how the remedy acts, whether it reduces secretion in the bowel above the obstruction and hence prevents distention of this intestinal area with fluid, or whether it aids by contracting the blood vessels in the occluded area and hence reduces the thickness of the bowel wall. Atropine should be given, hypodermically, in large doses of a sixtieth to a thirtieth of a grain (0.001 to 0.002 gm.), three or four times in the course of thirty-six to forty-eight hours. If the bowel passage is not opened after the third injection, then it is useless to continue the exhibition of atropine any further.

It will be seen, therefore, that the use of atropine in ileus invariably partakes of the character of a therapeutic experiment that, in rare cases, produces brilliant results, but unfortunately, in the majority, produces no results whatever. As no harm can ever accrue to the patient from the use of atropine, especially if lavage, irrigation, etc., are performed at the same time, and provided valuable time is not wasted thereby in clearly surgical cases, the administration of three or four doses of the drug can be recommended in most cases. This applies even to cases of ileus that develop on the basis of a chronically stenosed bowel; for here the removal of the fecal plug, or the foreign body, which may have produced the complete occlusion has occasionally been facilitated by atropine. In cases, finally, that are clearly due to fecal obstruction or to impaction of a gall stone in an otherwise normal intestine it is especially useful.

Laxatives

Laxatives are distinctly contra-indicated in all forms of acute intestinal obstruction, with the possible exception of fecal occlusion of the bowel. If the latter diagnosis can be positively made, and this will be an exceptionally rare event, laxatives may be safely given. Even in this group of cases, however, they should be given early in the disease as otherwise paralysis of the bowel wall above the fecal plug may have supervened. In this case removal of the fecal plug by the use of laxatives would not materially relieve the situation; for the mass of after-coming bowel contents would be packed forcibly into the paralyzed area which, being unable to propel this mass onward, would in its turn become obstructed by a new and more bulky fecal plug. Besides, in fecal obstruction of somewhat longer standing, especially when it develops upon the basis of a chronic progressive stenosis of the bowel, there is always danger of ulceration and increased friability of the intestinal wall above the obstructed area, so that in these cases the administration of laxatives favors rupture or perforation. Several cases are on record in which this accident occurred after the administration of laxatives.

In cases of ileus, finally, in which the character of the occlusion is doubtful laxatives should, by all means, be withheld; for if the bowel occlusion is not due to fecal obstruction they may do serious harm even if given early.

In nearly all cases of ileus laxatives increase the distress of the patient, especially the vomiting and the pain. Oftentimes, in fact, fecal vomiting only occurs after the administration of purgative drugs. On account of the increased pain and peristalsis that may be produced by these remedies, collapse, too, may be precipitated by their use. Finally, purgatives may do decided harm in ileus due to knuckling of the bowel, strangulation, axial rotation or intussusception. This can sometimes be positively determined, in cases that present favorable conditions for examination, by palpation of the abdomen; for upon the administration of laxatives the abdominal tumor will be felt to grow harder and larger. In occlusion due to a foreign body or to a gall stone impaction, purgatives do very little good; for the bowel wall is already putting forward its maximum effort to propel the obstacle onward, and to over-stimulate peristaltic movements that are already abnormally exaggerated can only do harm.

It will be seen, therefore, that laxatives are preferably altogether avoided in any form of ileus unless the case is one of very recent fecal obstruction occurring in an individual whose bowel movements, up to the time the ileus occurred, were normal in calibre. Late in fecal obstruction, or in any other form of sudden occlusion of the bowel, laxatives are best avoided. In view of the great difficulty of making a positive diagnosis of fecal obstruction in any case the administration of laxatives in general is to be condemned.

Massage

Massage of the bowel performed by an expert masseur, preferably under an anesthetic, sometimes aids, when used in combination with other measures, in relieving occlusion of the bowel due to a fecal plug or an impacted gall stone or foreign body. Massage may be performed either by directly kneading and pushing the obturation onward, or by stimulating the bowel wall, around and immediately above the occluded area, to increased contractions. Here, again, this method of treatment is dangerous in cases of fecal occlusion or foreign body obturation that are not quite recent, on account of possibly causing rupture of the friable intestine or of producing perforation of a stercoral ulcer that may have formed in the area of coprostasis.

In all the other forms of intestinal occlusion massage must be considered altogether dangerous, especially on account of the friability of the intestinal wall, and the danger of ulceration or gangrene about the occluded area. In fecal obstruction of the colon, however, massage of the large intestine, preceded by an oil injection to soften the fecal plug, is of considerable value, but, even in this variety of cases, one can get along very well without massage. Consequently this method of treatment, which was formerly very popular, must be considered to have an exceedingly limited field of application.

Electricity

Electric treatment is, in most cases, a waste of time. The only condition in which it might do some good would be in bowel paralysis following the removal of the obturator. This sequel of ileus may be treated by applying two electrodes to the abdominal surfaces and passing a strong faradic current through them, or by applying one pole to the abdomen and inserting the other one in the rectum and using a galvanic current. Either form of current should be used in the same manner and same strength as described in *Stomach Diseases,* on page 390.

Hot and cold applications

Hot or cold applications to the abdomen in the form of hot water bags, stupes, compresses, a thermophore or a Leiter coil charged with hot or cold water are useful as counter-irritants, chiefly to aid in controlling the pain. If peritonitic symptoms appear, cold is more useful than heat, otherwise the sensations of the sufferer alone must be considered and heat or cold applied according to the likes and dislikes and the general reaction of the patient.

Meteorism

Puncture of the bowel

In cases of very extreme meteorism in which surgical relief cannot be promptly obtained, or in which the patient or relatives refuse an operation, puncture of the intestine with a fine needle trocar not larger in calibre than the needle of a hypodermic syringe, may be performed in order to promote the escape of gases. In this way the intra-abdominal pressure may be materially reduced and some symptomatic relief obtained. In addition, the reduction of the pressure occasionally aids in relieving certain forms of intestinal obstruction. Here the same effect is produced as by the relief of abdominal pressure by stomach lavage (see page 427). Paracentesis of the bowel must, however, always be considered a very precarious procedure and one that should never be resorted to in any case in which a laparotomy can be performed, or in which there is any possible way to obtain relief of the meteorism by other means. The chief danger from puncture of the bowel is evidently the development of peritonitis, especially in cases in which the bowel is paralyzed or gangrenous. Under these conditions the puncture opening may not close promptly or completely and bowel contents ooze into the peritoneal cavity. Inasmuch as over-distention of the bowel from excessive meteorism frequently leads to paralysis or even gangrene, it will be seen how dangerous this operation is. In fact, the interference with the normal blood supply in the bowel, that commonly results from the over-stretching of the bowel wall, renders it possible for gangrene to develop secondarily about the trocar opening, so that perforation or rupture of the bowel and peritonitis may follow some time after the puncture has been performed. The operation, moreover, is not always easy to perform and it may occasionally be necessary to insert the needle several times before a loop of bowel is actually punctured; or the bowel may be punctured but no gas escape, so that a second or a third insertion of the needle may become necessary. Under these conditions, the dangers resulting from the puncture are, of course, still more increased.

Diet

Very little need be said in regard to the diet in cases of acute intestinal occlusion. Complete abstinence from solid or liquid food is absolutely necessary. The introduction of any food by mouth can only increase the accumulation of material behind the obstacle. In ileus, the administration of food or drink is a useless procedure inasmuch as the power of the stomach or intestine to absorb any of the gastric or intestinal contents is practically inhibited. Moreover, vomiting, which may be aggravated by the introduction of food, would promptly expel everything that might be introduced into the stomach. There is rarely any difficulty in maintaing total abstinence from food, as the patients themselves never manifest a desire to eat anything.

Thirst

Most of them, however, suffer from excessive thirst. This symptom is usually materially allayed by the use of opium, as described above. If the thirst is very distressing, it may be somewhat relieved by allowing the patient to suck a little ice, or to allow ice pills moistened with a few drops of brandy to dissolve in the mouth. They should always be instructed not to swallow the water. Washing out the mouth at frequent intervals with plain water or soda solution is usually very grateful to the sufferers.

Hypodermoclysis

The administration of water by hypodermoclysis in the form of normal salt solution, or in the same form by rectal irrigation, is a useful means of supplying to some extent the water demands of the organism.

Rectal feeding

Rectal feeding, however, is rarely indicated, especially if an operation is performed within forty-eight hours after the onset of the trouble in all cases that do not yield to other means by that time.

Diet in chronic stenosis

In chronic stenosis of the bowel in which the time for operation has not yet arrived, or in which the conditions producing the stenosis are unalterable, or in which the patient refuses an operation, the diet should, as a prophylactic means, be arranged in such a way as to prevent a sudden occlusion of the stenosed area. In order to fulfill this purpose a diet that leaves the smallest possible residue in the bowel and that contains no coarse particles that might form a plug in the stenotic area, is advisable. The food, therefore, should consist largely of milk, eggs, broths, strained gruels, vegetable purées, butter, cream, scraped or hashed meats, carefully freed from skin and tendons. Raw fruit and vegetables containing seeds, stems, pips, kernels, skins, etc., cereals containing husks, pips, seeds, stems, skins, coarse breads and similar foods should be absolutely forbidden. The patient should be instructed to most carefully masticate his food and to eat small meals at a time.

Constipation

Any tendency to constipation should be overcome by giving fruit sauces and abundant fat with the diet and by instructing the patient to drink olive oil once or twice a day. At the same time the lower bowel should be kept thoroughly cleaned out by means of enemata (see page 450), and, with great care, mild vegetable laxatives like cascara, rhubarb, senna, etc., or gently-acting laxative waters, or an occasional dose of castor oil may be administered. In cases, however, in which the stenosis has advanced to such a point that the peristaltic action of the intestine is greatly increased, as manifested by the appearance of visible and palpable peristaltic waves on the abdomen, laxatives of any kind are, to say the least, superfluous. For, in these cases, the bowel wall is manifestly already putting forward its maximum effort to overcome the obstruction. Here, in fact, much more can be gained from the administration of opium, for reasons that have been discussed in full above, than from the administration of laxatives.

In sudden intestinal occlusion occurring on the basis of a chronic stenosis of the bowel, the same rules of treatment obtain as in any other form of acute ileus, only that here the indications for surgical intervention are more exact and positive, because generally abundant time has been given to determine the nature of the lesion and its precise location in the abdomen.

INTESTINAL ULCER.

The treatment of ulcer of the bowel is largely limited to the symptomatic relief of the diarrhea, the pain and the hemorrhages.

Causal treatment

The causal treatment of ulceration of the bowel occurring in the course of different infectious diseases, as tuberculosis, typhoid, dysentery, erysipelas, variola, sepsis, etc., is synonymous with the treatment of the underlying disorder. The same applies to the causal treatment of intestinal ulcers occurring in the course of leukemia, gout, the hemorrhagic diathesis, or in uremia. Syphilitic ulcers of the bowel are self-evidently amenable to antiluetic treatment. Stercoral ulcers occurring as the result of chronic constipation or in stenosis of the bowel, if they are at all discovered before perforation occurs, should be treated by correction of the underlying constipation, or mechanically, i. e., by surgical correction of the stenosis of the bowel lumen. The radical removal of an ulcerous area by excision may be included under the possible methods of causal treatment.

Rest in bed

Diet

A patient, with an intestinal ulcer producing much diarrhea, or causing much pain and showing a tendency to hemorrhage, should remain in bed. The diet, broadly speaking, should be arranged according to the same principles that obtain in chronic catarrh with diarrhea, i. e., it should be free from mechanical, chemical or thermical irritants, should be easily digestible and, at the same time, sufficiently nutritious to maintain the physical equilibrium of the patient. The ideal, therefore, is a nutritious liquid or semi-liquid diet consisting largely of milk, broths, milk dishes, strained gruels, etc., given in small quantities and at frequent intervals.

Hot and cold applications

Heat or cold applied to the abdomen in most cases materially aid in relieving the severe distress of the patient and in reducing violent peristaltic movements of the bowel; they, therefore, act curatively, in a sense, by allowing the bowel to remain at rest and by checking the diarrhea. If there is evidence of peritonitic irritation, cold applications to the painful area, provided it can be definitely localized, are the best, otherwise, heat, either dry or moist, is more pleasant to the patient and probably more efficacious. The patient should be instructed to keep the ice bag or the hot water bag, or the Leiter coil, or the compress continuously in place.

Internal remedies

Bismuth

Very little can be expected from internal remedies given for the purpose of healing an intestinal ulcer. The most popular preparations and the ones that are almost universally employed for this purpose are bismuth salts and tannin derivatives. If bismuth is given, it should be administered in large quanties, preferably in pills coated with salol; for the latter resist the acid gastric juice and are not dissolved until they reach the alkaline medium of the intestine. It is questionable whether even large doses of bismuth can really form a coating over one or multiple ulcers when distributed throughout the length of the small intestine. Bismuth may be given in the form of the subnitrate or the subgallate, or as dermatol in doses of fifteen to twenty grains (1 to 1.3 gm.), several times a day.

Opium

Together with the bismuth a quarter or an eighth grain of opium can, to advantage, be administered; for both the bismuth and the opium possess hemostatic and anti-diarrheic properties and the latter, moreover, acts as an anodyne in painful ulcers. If opium is to be administered alone, it is better given in suppository or clysma, or hypodermically, than by mouth, especially if larger quantities are to be administered.

Tannalbin Tannigen

The best tannin preparations are tannalbin or tannigen (see page 420), given either alone or with opium. The antiseptic properties of the tannin preparations combined with the anti-diarrheic and anodyne properties of opium make this a useful combination.

Ulcers of colon and rectum

Astringents and disinfectants

Ulcers of the colon and rectum are amenable to local treatment. Here astringent and disinfectant irrigations may be employed. The safest disinfectant solutions are thymol, 1:100; salicylic acid or boric acid, 1:500. Bichloride of mercury injections or solutions of carbolic acid should never be employed in ulceration of the lower bowel, as there is always danger from this practice of producing general carbolic acid or mercurial poisoning.

The most useful astringent solutions are silver nitrate, 1:100; or tannic acid in the same strength. Silver nitrate injections or instillations frequently produce violent tenesmus. If these painful sensations persist for some time, or become unbearable to the sufferer, then an injection of a salt solution will cause precipitation of the silver nitrate as silver chloride and stop the irritation.

Intestinal hemorrhage

Opium

Ergot

Hydrastis

In case of intestinal hemorrhage, complete rest in bed and total abstinence from food should be insisted upon. Even after the hemorrhage has stopped the diet should be liquid, exclusively, for several days or longer, i. e., until even chemical traces of blood have disappeared from the stools. The application of the ice bag to the abdomen is useless unless there is evidence of peritonitic irritation. The best remedy is opium given in suppository or by mouth; it acts chiefly by arresting peristalsis and hence placing the bowel at rest and favoring clotting and arrest of the hemorrhage. Ergot, given as the fluid extract in the dose of one to two drachms (4 to 8 cc.), or as the dry extract in the dose of three to fifteen grains (0.2 to 1 gm.), by mouth, or as the Injectio Ergotina Hypodermica, three to ten drops, is, in my experience, of very doubtful value. Much better is hydrastis, given as the fluid extract in doses of fifteen to sixty minims (1 to 4 cc.), or as hydrastinine hydrochlorate, in doses of one-half to two grains (0.03 to 0.1 gm.), or as stypticine, in the dose of one-third to one-half grain (0.2 to 0.3) several times a day. **Hamamelis** Hamamelis, in the form of the fluid extract, in thirty minim (2 cc.) doses, repeated several times, is also a useful remedy. Very good results are often obtained from the use of adrenalin **Adrenalin chloride** chloride, given in ten to fifteen drop doses of a 1:1000 solution, several times at two or three hour intervals. **Calcium chloride** Calcium chloride, in thirty grain doses (2 gm.) in watery solution, repeated several times, is also a method of treatment that is worthy of a trial. The latter remedy, of course, is given with the object merely of promoting coagulation.

Gelatin Gelatin solutions are also occasionally of use; they should be administered as described in the Section on *Hemoptysis* (page 311). **Bismuth** **Lead acetate** **Perchloride of iron** Bismuth and lead acetate and, above all, the perchloride of iron, three preparations that are very popular, are, in my experience, utterly devoid of value in arresting intestinal hemorrhages. It is possible that the perchloride may be effective indirectly in large hemorrhages by causing the formation of a clot that acts as a tampon in the intestine.

Hemorrhages from colon or rectum In hemorrhages occurring from ulcers of the colon or the rectum, irrigations with hot water are usually effective. Ice water injections are, as a rule, dangerous because they produce active peristalsis, which prevents clotting of blood and may lead to further hemorrhage. In very extreme cases, however, that resist all other treatment, ice water applied directly to the bleeding spot, provided it can be seen through the rectoscope or sigmoidoscope, may be tried as an emergency measure. The addition of tannin, silver nitrate or alum to the hot water can do no harm; better still are calcium chloride solutions, employed in the strength of 4:1000, for the latter salt in many cases aids in the local coagulation of the blood. Adrenalin solutions; solutions of the fluid extract of hamamelis; or a solution of gelatin 10:200, all administered in small quantities by rectum, are also often efficacious in arresting hemorrhage of the large intestine.

Collapse and secondary hemorrhage The treatment of collapse symptoms occurring upon the onset or during the course of an intestinal hemorrhage, and the treatment of the secondary anemia that generally follows severe intestinal bleeding, has already been discussed in full in different sections of this book (see index).

MEMBRANOUS ENTERITIS AND MUCOUS COLIC.

Definition

The excretion of large quantities of mucus may accompany any form of intestinal catarrh; it may also occur without enteritis. Inasmuch as most cases of intestinal catarrh run their course without the expulsion of abundant mucus, one must postulate, in that variety in which mucous stools occur, the existence of some specific element that determines the excretion of mucus. The exact character of this element is uncertain, but, in all probability it is a general neuropathic disposition that upon the incidence of certain determining factors like intestinal catarrh in enteritis membranacea, or chronic constipation in simple mucous colitis (colica mucosa), leads to over activity of the secretory glands of the bowel.

Neurotic element

Causal treatment

As a matter of fact, a nervous disposition and general neurotic manifestations will be found in nearly all cases suffering from either of the two diseases under discussion. Causal treatment in any case must, therefore, attack the underlying neurasthenia or hysteria. In cases suffering from true enteritis, the intestinal catarrh must be treated, whereas in cases of mucous colitis, it is, of course, useless to treat a hypothetical catarrhal condition that does not really exist.

As a prophylactic measure and as an important symptomatic treatment during the attacks, the evacuation of the mucus must be accelerated by artificial means; for in this way the attacks of colic are mitigated and abbreviated, or altogether aborted.

Treatment of the neurosis

The treatment of the underlying neurasthenia or hysteria must be carried out according to the principles that have been described at length in the Section on *Gastric Neuroses*. A rest cure with isolation, or a Weir Mitchell treatment; various hydrotherapeutic or electrotherapeutic measures; the removal of reflex irritation emanating from any organ of the body; change of scene; a pause in the daily routine; respite from worry and mental overwork; avoidance of all psychic or emotional shocks; in fact, all the psychic and physical means that are often so effective in re-establishing nervous equilibrium, must be employed. The results from this treatment, the exact arrangement of which must needs vary according to the peculiarities of each individual case, the surroundings, the state of life of the patient, are generally very satisfactory, although, as a rule, not permanent.

To produce evacuation of the mucus

The most effective means of producing evacuation of the mucus is by irrigation of the bowel with warm water or with a normal salt solution containing from 6 to 8 grammes of sodium

Primary habitual constipation

mary, habitual constipation occur and they form the proper subject of this section.

Atonic and spastic constipation

Here it is important to determine whether one is dealing simply with insufficiency of the intestinal musculature (usually associated with secretory anomalies) or with spasticity of the bowel muscles.

Spastic constipation

Causal treatment

The spastic form of constipation usually develops on the basis of various functional disorders of the nervous system, notably neurasthenia and hysteria, also in certain organic disorders of the cerebro-spinal axis and, finally, in certain forms of intoxication, chiefly by lead. Causal treatment of this form of constipation must be directed primarily against the organic lesions of the brain or cord, that are frequently of syphilitic origin and hence may call for antiluetic medication, or against the poison that produces the bowel spasticity. In the purely neurotic form the same general hygienic, hydrotherapeutic, electrotherapeutic and psychic measures that have been described at length in the section on the *Gastric Neuroses*, can be applied, and the results obtained from this therapy are generally satisfactory.

Symptomatic treatment

Opium and belladonna

If it is impossible to remove the primary cause, symptomatic treatment must be attempted. Here the sovereign remedies are opium and belladonna, both drugs that reduce the sensibility of the gastric mucosa and, in this way, reduce the reflex spasticity of the bowel wall. Paradoxical as it may sound, therefore, opium, which, as presently will be shown, is one of the chief remedies in the treatment of diarrhea, becomes in this class of cases the most important means of relieving constipation. Laxative remedies, massage, irrigation of the bowel, all measures that are exceedingly useful in the atonic form of constipation to be presently discussed, are directly harmful in this variety.

Whereas spastic constipation is a comparatively rare disorder, the atonic variety, which is characterized by weakness of the bowel musculature, is very frequent and probably constitutes the majority of the cases of habitual constipation that are encountered in practice.

Atonic constipation

Uses and abuses of vegetable-fat diet

In atonic constipation, as in the alimentary variety, the administration of a vegetarian fat diet generally produces relief. This regime should, however, be instituted with some care and conservatism; for, in rare instances, it will be found that the relief obtained from the institution of such a diet is not permanent, and that after a few free defecations, the bowels become constipated again. This phenomenon must generally be attributed to habituation of the bowel wall to the mechanical and chemical irritation of such a diet, so that the atonic musculature of the bowel after a short time refuses to respond to the stimulus that, in the beginning, incited it to increased contractions and forcible propulsion onward of the voluminous contents. If this sequence of events occurs, then it is wrong to persist in the use of the vegetable-fat diet; for the latter will stagnate in the bowel and injure the atonic bowel wall both by its bulk and by the irritation that emanates from acid and gaseous fermentative decomposition products that form from the stagnating material. In such a case the evacuation of the bowel contents must, in the beginning, often be promoted by other than dietetic means.

Additions to above diet

If it is found, however, that, in favorable cases, the diet described above continues to produce copious daily stools, then there may be added to this diet salt foods of different kinds, i. e., salt meat, salt fish; for the sodium chloride that these articles contain draws water into the bowel, or at least, like sugar, prevents the absorption of a certain proportion of the water from the bowel. This self-evidently promotes the liquefaction of the bowel contents. In order to further render the stools soft and pultaceous abundant liquid should, by all means, be ingested. Cold, plain water or, better still, cold aërated, i. e., carbonated, beverages are very useful and a glass of cold soda water or of plain water, taken on an empty stomach, is, in many instances, an efficient means to stimulate defecation. Beer, kephyr, sour milk and similar beverages containing yeast cells, are also particularly useful; for they aid in the formation of carbon dioxide in the bowel from the starchy or sweet pabulum that, as stated above, should be administered in abundant quantities. Fruits containing abundant water, especially, therefore, melons, juicy pears, apples, peaches, plums, are also valuable in this condition and constitute a very convenient means of introducing large quantities of liquid together with sugar and fruit acids and a certain amount of indigestible cellulose residue. Coffee, in most cases of this kind, acts as a laxative. Tea, on the other hand, and claret, on account of the tannic acid they contain, as well as chocolate and cocoa, are less useful, in fact, have a tendency to constipate. Milk, in the majority of people, produces a constipating effect. In others, again, it produces diarrhea. Gruels, if the coarse particles are strained off, also constipate and should hence be avoided.

Salt foods

Abundant water

Beverages containing yeast cells

Juicy fruits

Coffee and tea

Claret

Chocolate

Milk

Gruels

It is necessary, therefore, as will be seen, to experiment a little in each case with different articles of food and drink, finally selecting a permanent dietary for these cases from the articles that are known to produce the desired laxative effect in each particular individual. It may be added in parenthesis that smoking a cigarette after breakfast often aids in stimulating peristalsis and procuring a good bowel movement.

Smoking

Education

An important element in the cure of atonic constipation is the education of the patient. An attempt at stool should be made at some regular time, preferably a little while after breakfast, and if the attempt is abortive for a few days, or if no desire for stool is experienced at this time, the effort should, nevertheless, be persisted in. On the other hand, the desire for stool at other times of the day should be suppressed; for, in this way a sufficient amount of fecal residue is allowed to accumulate for expulsion at the proper time.

Massage

Massage of the bowel and abdomen is a very important aid to the treatment. The main objects of massage are to stimulate the peristalsis of the bowel, especially of the large intestine, and to mechanically propel the bowel contents onward by forcibly kneading and compressing the colon. In order to be effective this massage treatment should, for a few weeks in the beginning, be carried on daily. It is best conducted in an institution in combination with proper hydrotherapeutic means and then, for many months afterwards, two or three times a week at home. Inasmuch as general abdominal massage, in order to be effective, should only be performed by a specially trained expert, and as the technique of massage cannot be learned from a verbal description, it need not be outlined in this volume.

Self-massage

A very simple means of self-massage, that I have found highly effective, is to roll a large wooden ball, of about five or six inches in diameter, over the abdomen for five or ten minutes every morning. The patient should lie on his back with the knees drawn up and should breathe with his mouth open in order to relax the abdominal muscles as much as possible. The ball is then placed in the right ileo-cecal region and under slight pressure gradually rolled around the abdomen following the course of the colon to the left inguinal region, and then back again to the right inguinal region.

Hydrotherapy

Of hydrotherapeutic measures, aside from those employed for the cure of the general neurasthenic or hysteric condition that so frequently underlies the atonic as well as the spastic form of constipation, the following measures are of particular use in overcoming constipation due to atony or abdominal congestion.

Cold sitz baths

Sitz baths are probably the best measures of all. If they are given cold, their first effect is to drive the blood away from the abdomen to the upper extremities. Very soon a reactive back flow of blood into the abdominal vessels occurs with a resulting hyperemia of the bowel wall. This back flow becomes sensible to the patient by a feeling of warmth. The reactive hyperemia produced in this way is beneficial, inasmuch as it improves the nutrition of the bowel musculature and hence aids in overcoming muscular atony. A cold sitz bath should last not longer than five to six minutes. If the patient leaves the cold water at the expiration of this time, the hyperemic effect is prolonged, whereas, if the patient remains in the water longer, a secondary condition of anemia occurs.

This secondary anemia can be utilized to advantage in catarrhal disease of the bowel in which it is desired precisely to reduce the hyperemia of the intestinal wall. Here, cold sitz baths carried out for fifteen to twenty minutes are more useful than short ones and exercise a good effect upon the constipation that not infrequently accompanies chronic intestinal catarrh. The effect of cold sitz baths can be enforced by having the patient vigorously rub the abdomen, legs and back while immersed in the water. The best time for giving the sitz bath treatment is late in the afternoon about an hour before the evening meal. Hot sitz baths lasting five to fifteen minutes are also useful inasmuch as they stimulate the whole digestive tract. Their mode of action is not so clearly understood as that of the cold baths, and the latter are by far more efficacious in overcoming atonic constipation.

Hot sitz baths

Douching the abdomen

Douching of the abdomen is also useful. The douches should be cool and the water should be directed with considerable force against the abdominal parietes. Cool douches are very stimulating and cause contractions both of the external abdominal muscles and of the muscularis of the intestine; they combine a thermic and a mechanical effect. In strong individuals Scottish douches are of particular value; they consist in directing an alternating stream of hot and cold water against the abdominal wall. The hot stream, combined with the mechanical effect of a strong jet of water, causes dilatation of the superficial vessels and the cold stream, following immediately afterwards, produces a rapid contraction. This change in the calibre of the superficial vessels is reflected in the vessels of the internal organs (see also page 448). A similar effect can often be exercised by directing a spray of ether against the sides or the front of the abdomen.

Scottish douches

Ether spray

Priessnitz compresses

Large, cool Priessnitz compresses, especially applied during the night, are also of great value in overcoming atonic constipation. They are applied by wringing a linen sheet out of cold water, placing it all around the abdomen and covering it with a flannel bandage. The water gradually evaporates through the pores of the flannel and in the morning the compress will be found dry and the skin underneath slightly hyperemic. In winter it is safer to rub the abdomen with alcohol and a dry towel before going out, if the Priessnitz compress has been applied during the night.

Exercises

Swedish movements

Passive and active exercises are also useful and any of the simpler free-hand exercises that stimulate contractions and stretching of the abdominal muscles and compress the liver and hence determine a flow of blood to the abdominal viscera, are useful. In institutions, Swedish movements answer the same purpose. Outdoor sports of all kinds are also very helpful; for the increased respiration and deep breathing stimulated thereby favor wide excursions of the diaphragm and hence, in a sense, constitute a massage of the whole abdominal contents.

Electricity

Electricity is of some value in atonic constipation. The most convenient way of giving electrical treatment is to perform faradization of the abdominal parietes by the aid of two large sponge electrodes that are placed a short distance apart upon different parts of the abdominal surfaces. As it is not desired by this faradization to produce long tetanic contractions of the colonic musculature, the electrodes should be constantly moved about, chiefly along the course of the colon, and not kept for any length of time in any one place. It is probable that faradization of the abdomen acts favorably in constipation more by causing vigorous contractions of the abdominal muscles than by its effect upon the bowel musculature itself. The galvanic current can be applied by the intra-rectal method. Here the same general rules apply as in the galvanic treatment of motor insufficiency of the stomach. A large sponge electrode should be placed upon the abdomen somewhere along the course of the colon, a little water is injected into the rectum and a rectal electrode inserted through a rectal tube and connected with the anode. Here weak currents applied only for three to five minutes are perfectly safe and answer all purposes.

Irrigation

To mechanically clean out the colon and to stimulate peristalsis of the lower bowel, irrigations are exceedingly useful; the colder their temperature, the more do they stimulate peristalsis. Ice water, however, is rarely used and in some cases hardly safe. Small quantities of cool water or of physiological salt solution injected into the colon with a high rectal tube answer all purposes. If it is desired merely to cleanse out the contents of the ampulla of the rectum, then lukewarm water is better than cold water.

Medicated enemata

Salt

Glauber salt

Soap

Vinegar

Castor oil and egg

In order to increase the stimulating effect of cool irrigations injected into the higher portions of the large intestine, certain chemical irritants can be added to the irrigating fluid, for instance, common salt or Glauber salt in the strength of two tablespoonfuls to the pint; or soapy water may be used, or a mixture of equal parts of vinegar and water. A very useful irrigating mixture is a tablespoonful of castor oil beaten with the yolk of one egg and mixed with a glass of cold water. This can be injected through a high rectal tube into the colon and exercises a very prompt evacuating effect.

Glycerin, on account of its hygroscopic properties, i. e., its power to draw water into the intestine, may be injected directly into the bowel by instillation. If pure glycerin irritates too much it should be given in watery solution in the dose of about two tablespoonfuls to the quart, and this mixture injected through an ordinary fountain syringe; or glycerin suppositories may be used. Soft stools are usually produced in a short time by the use of glycerin.

Oil injections

Finally, olive oil or sweet oil in the dose of 150 to 500 cc. may be injected through a high rectal tube, five to ten minutes being consumed in the process. Oil acts by loosening the pieces of feces that are firmly attached to the colon wall, it allays local irritation and hence spasmodic contractions of the bowel musculature, it prevents water absorption and hence keeps the stools pultaceous, and it, finally, leads to the formation of oleic acid, which actively stimulates the peristaltic action of the colonic musculature. Even if a free evacuation of the bowels occurs after an oil injection, a certain quantity of the oil is usually retained, unless the oil injection is followed by a copious soap and water enema. Hence, if no water injection is given, then smaller quantities of oil may be injected on subsequent days. If pure oil is not retained well, then it may be beaten up with a yolk of egg and water, as described above, and five to ten drops of the tincture of opium added to the mixture. This irrigating emulsion is almost invariably retained without difficulty.

Small and large enemata

The chief advantage of using these small amounts of irrigating fluid for the purpose of stimulating local peristalsis and mechanically softening the stools, is that the stomach is not irritated by the ingestion of laxative purgatives or drastic remedies. Large quantities of irrigating fluid are not so safe on account of the inevitable stretching and relaxation of the atonic bowel that they produce. This detrimental effect of large enemata can to some extent be counteracted by using irrigations of low temperature, for the cool water causes contraction of the bowel musculature and hence neutralizes, to some extent, the mechanical stretching of the bowel wall. If it becomes necessary to flush out the whole colon, it is best to do this by means of a back flow catheter or by repeated small injections. The best time for irrigating the bowel in chronic constipation, especially if irrigations are ordered for daily use or several times a week, is immediately after breakfast. The irrigations should, by all means, always be given at the same time of the day.

Laxatives

The haphazard and indiscreet administration of laxatives that is so commonly employed in cases of chronic constipation is, in most cases, directly harmful to the patient and, at best, bestows only temporary relief. Far from curing constipation, it usually aggravates the conditions that it is intended to correct and makes the patient a slave to the use of this class of drugs.

In the spastic form of constipation, as already mentioned above, laxatives are rarely needed; in fact, they are usually harmful, and opium and belladonna are the proper remedies. In the atonic form laxatives should also be given with great care and in small doses. If they are given in doses large enough to produce a diarrheic stool, then a condition of constipation, as is well known, usually follows for several days thereafter, which will generally, in its turn, have to be relieved again by large doses of a purgative.

Choice of laxative

Alternation

After all the dietetic and mechanical means that have been described above fail, then it may become necessary, in rare cases, to resort for a time at least to the use of certain laxative drugs. It is impossible to predict in any one case which of the many laxatives that can be employed will be effective, and it is necessary to experiment a little in each individual. Even if one drug is found to be effective for a while, then it is always a good plan to alternate from time to time with some other remedy in order to prevent habituation to any one laxative. That the smallest possible dose to produce the desired effect should be administered in these cases need hardly be mentioned. For continued use in chronic constipation, either alone or, far better, in combination with dietetic and physical measures, I have selected a few remedies out of the immense number of laxatives that are contained in the Materia Medica. These as probably the least harmful and the most efficacious in relatively small doses. It is impossible to enumerate and describe the dose and administration of all the laxatives that are known. For this information I refer to text books on pharmacology.

The different groups of purgatives

Mode of action

The vegetable purgatives, i. e., the purgative oils (castor oil, croton oil), anthracene purgatives (rhubarb, senna, aloes, frangulus, cascara and others) and the preparations of the jalapin and colocynthin group (colocynth, podophyllum, jalap, elaterin, leptandra and others), all act by irritating the bowel mucosa, thereby stimulating peristaltic movements of the intestine and hastening the propulsion onward of the bowel contents. In this way less time is given for the absorption of water from the small intestine, and the stools, consequently, reach the colon in a liquid or pultaceous form and are promptly evacuated. It is possible that these remedies, also, at the same time, cause an increased outpouring of watery secretions into the bowel. The character of the stool deposited after the administration of these remedies will, of course, largely depend upon the dose. Small doses produce one or two soft movements, very large doses produce profuse, frequent watery evacuations. It is unnecessary, however, to retain the old classification into aperient, laxative, purgative, hydragogue cathartic and drastic remedies, the violence of their action depending largely upon the dose, not the character of the drugs.

Nomenclature and definition

Saline cathartics

Saline cathartics do not irritate the intestine unless given in very large quantities. They act chiefly by retarding the absorption of water from the bowel and, to some extent, by increasing intestinal peristalsis, more on account of their bulk, however, than because of any irritating action that they exercise upon the intestinal mucosa. In addition, they act as concentrated solutions of salts that are only slightly diffusible through the bowel wall into the blood, and hence, according to the laws of osmosis, draw water into the bowel.

Mercurial purgatives

The mercurial purgatives, chiefly insoluble preparations like calomel (blue pill and gray powder), do not affect the stomach, but irritate the bowel, owing to their long sojourn there, which leads to their partial conversion into irritating soluble salts of mercury.

Indications for the use of different laxatives

In order to produce a mildly laxative effect, cascara, rhubarb, aloes, podophyllin or an alkaline saline are the best remedies for continued use. If large, hard fecal masses have accumulated in the bowel, these milder remedies are very apt to produce griping, so that castor oil, calomel, jalap and colocynth are better. If the patient is in an unconscious state or in a condition of mania, so that no medicine can be swallowed, one or two drops of croton oil placed on the back of the tongue are more effective. In lead colic, too, with obstinate constipation, croton oil, administered as above, is especially useful. Combinations of the vegetable purgatives with salines or with bitter tonics are justly popular.

Cascara

Cascara is best given as the fluid extract, in doses of one-half to one teaspoonful; or as the wine of cascara, in doses of one to two tablespoonfuls; or as the dry extract, in doses of two to eight grains (0.1 to 0.5 gm.). It produces a mild laxative effect usually within twelve to eighteen hours after its administration. It is, therefore, eminently useful in habitual constipation that does not yield to other means, if given every night before retiring.

Rhubarb and senna

Rhubarb and senna are both old established remedies of tried effect. The chief drawback to the use of rhubarb is its tendency to produce constipation after the evacuation of the bowel contents has been brought about. It is best, therefore, dispensed in combination with a saline cathartic as, for instance, in the compound rhubarb powder, twenty to sixty grains (1.3 to 4 gm.); or as the Compound Infusion of Senna (black draught), two to four ounces (60 to 120 cc.); or as the Compound Mixture of Senna, one-half to two fluid ounces (15 to 60 cc.); the Mistura Rhei et Sodæ, two to three ounces (60 to 100 cc.); or the Syrups of Rhubarb or Senna, in doses of one to three drachms (4 to 12 cc.). Senna is more active than rhubarb bulk for bulk. The former remedy, however, as well as aloes, to be presently discussed, should be given with considerable care in inflammatory disorders of the intestine, in renal inflammation and in pregnancy.

Aloes

Aloes may be given alone in the form of the extract, two to seven grains (0.1 to 0.6 gm.); or in combination with rhubarb, cascara or senna in pill form; or as the Pil. Aloes, one to five pills at a dose; or as the Compound Laxative Pill containing aloes, strychnine, belladonna and ipecac; also as aloes contained in the Compound Extract of Colocynth, the Compound Rhubarb Pill and the Compound Tincture of Benzoin. Any of these preparations are useful.

Podophyllum

Podophyllum is especially valuable for continued use in habitual constipation. It is best given in combination with belladonna as the latter neutralizes, to some extent, the irritation and the colic sometimes produced by podophyllum. The effect of small doses of podophyllum does not become apparent for about twelve hours after its administration, so that it is best given in the evening before retiring. Convenient pharmaceutical preparations of podophyllum are the Pill of Podophyllum, Belladonna and Capsicum (U. S. P.), and the resin of podophyllum, one-quarter to one grain (15 to 60 mg.) in pill form. Podophyllum is a remedy of varying strength and not always reliable.

Jalap

Jalap, too, is best given in pill as the resin of jalap, in doses of two to five grains (0.1 to 0.3 gm.); or as the Compound Jalap Powder, in doses of fifteen to sixty grains (1 to 4 gm.).

Elaterium

Elaterium may be given as the triturate or the compound powder; the former containing one part of elaterin to nine parts of sugar of milk and employed in doses of one-quarter to one grain (15 to 60 mg.); the latter containing thirty-nine parts of sugar of milk and given in doses of one to four grains (0.06 to 0.25 gm.).

Neither of the last remedies should be administered continuously in habitual constipation. They are useful particularly if it is desired to produce a rapid evacuation of accumulated feces.

Sulphur

Sulphur alone, or in combination with rhubarb, magnesia, or milk sugar, produces a soft, well formed stool. An equal mixture of precipitated sulphur, powdered rhubarb, sugar of milk and magnesia, taken in the dose of a teaspoonful with a glass of water every morning and evening, is one of the simplest, least harmful and most efficacious remedies for continued use in cases of chronic constipation that do not yield to the proper diet and to physical means, or that are due to anatomic conditions that demand the use of laxative remedies.

Saline laxatives

A large number of saline laxatives may be employed in the treatment of chronic constipation. It is a very difficult matter to choose among them. The chief members of this group that are employed in medicine are the sulphate of soda (Glauber salt) and the sulphate of magnesia (Epsom salt), both given in doses of thirty grains to one ounce (2 to 30 gm.) in solution, preferably in milk. It is important that they should not be given in a greater concentration than about ten per cent. Phosphate of soda is given in doses of fifteen grains to one ounce (1 to 30 gm.), in the same way as the sulphates of soda and magnesia. The double tartrates of potassium and sodium (Rochelle salts), and the citrates of potassium and magnesium, are both given in doses of fifteen to forty-five grains (1 to 3 gm.) in solution. The oxide and carbonate of magnesia, in doses of five to sixty grains (0.3 to 4 gm.) are useful administered in a powder sweetened with sugar of milk or in one of the combinations enumerated above.

Effervescent salts

Besides, a number of effervescent laxative salts are given. The best known of these is the Seidlitz powder. This is made up in two papers, a blue one and a white one, the former containing three parts of Rochelle salt and one part of sodium carbonate, in all one hundred and sixty grains (10.4 gm.); the latter containing thirty-eight grains (2.25 gm.) of tartaric acid. The powders are dissolved separately in water and the two solutions poured together and the whole rapidly swallowed. The liquor of magnesia citrate is a solution of magnesium citrate with an excess of citric acid and potassium bicarbonate bottled tightly; upon opening the bottle effervescence occurs. The dose of this solution is five to twelve ounces (150 to 400 cc.).

Laxative mineral waters

A great many natural mineral waters containing laxative salts are used. The best of these are Hunyadi Janos or Apenta water or Carlsbad water. The action of these waters is due chiefly to the sodium or magnesium sulphate they contain. In addition they contain a number of inert and less active saline constituents.

Hypodermic purgation

The attempt has been made repeatedly to induce purgation by the administration of remedies hypodermically. The best remedy for this use is apocodeine, which should be given in doses of one-twentieth to one-tenth grain (3 to 6 mg.), dissolved in a little water. Besides, aloin, cathartinic acid and citrullin have been used, but their administration is very painful and their effect is inconstant. Magnesium sulphate injected in small doses hypodermically is the latest hypodermic purgative to be introduced.

Introduction of purgatives by rectum

Finally, the administration of purgative remedies may be attempted by the rectal route. Colocynth in the dose of 0.1 to 0.03 gm.; aloin, 0.4 to 0.5 gm.; and cathartinic acid, 0.6 gm. dissolved in a little glycerin cause prompt purgation. It is probable that these remedies after they have been absorbed from the rectum are carried to the intestinal mucosa through the blood, and act in this way rather than locally.

DIARRHEA.

Diarrhea in intestinal atony, stenosis and catarrh

Diarrhea, in most cases, is a symptom only of a variety of primary conditions, the treatment of which has already been discussed. Thus diarrhea from irritation of the bowel wall by stagnating and decomposing or poisonous (ptomains) bowel contents is a common phenomenon in bowel stenosis, in coprostasis and in acute or chronic catarrh of the bowel. Here treatment must, in all cases, be chiefly directed towards promoting prompt evacuation of the offending bowel contents by the administration of castor oil, calomel or the use of bowel irrigation as already fully described in the sections on these different disorders. Besides, of course, the underlying disorder must be attacked and, if possible, corrected.

Laxative diet as a prophylactic

In diarrhea occurring in fecal stasis due to stenosis or intestinal atony, it is important, contradictory as it may seem, to give a slightly laxative diet (see page 444) rather than one that possesses constipating properties; for, in this way only can the accumulation of fecal matter that directly produces the diarrhea, effectually be forestalled.

Diarrhea gastrica

An important form of diarrhea (diarrhea gastrica) occasionally owes its origin to disorders of the stomach, chiefly achylia gastrica and motor insufficiency of the stomach or hyperacidity. This variety is closely related to the one mentioned above, inasmuch as the food fails to undergo proper disassimilation in the stomach, and enters the bowel in an insufficiently digested or partially decomposed condition, and hence throws an abnormal amount of labor on the tryptic functions of the intestine, while, at the same time, irritating and overloading the canal. This overtaxation and irritation may become so great as to produce true catarrh of the bowel with diarrhea, but even before this time the intestine periodically gets rid of the abnormal material which it cannot properly assimilate by diarrheic movements. Many of these cases do not apparently suffer from the stomach at all, especially if the motor power of this organ is unimpaired. At the same time, the primary disorder probably lies in the stomach alone and the treatment of the underlying gastric disorder by proper dietetic and medicinal means, lavage, etc., generally leads to a cure of the diarrhea. From this it will be seen how important it is in every case of chronic diarrhea of doubtful origin to carefully determine the state of the gastric functions and to arrange treatment accordingly.

Diarrhea dyspeptica

Dyspeptic (or better dystryptic) diarrhea must be included in a similar category. Here the bowel irritation, the increased peristalsis, the very rapid propulsion of the contents of the small intestine into the colon and its prompt evacuation in the stools must be attributed to the ingestion of food that is irritating or poisonous. In this variety, too, the stomach is usually, though not always, affected at the same time. Here, again, the chief indication for treatment lies in aiding Nature in its endeavor to rid the bowel of the irritating material; and the prompt administration of a dose of castor oil or of some other effective, but not too irritating, laxative remedy (see index) combined with cleansing of the lower bowel by irrigation, is the proper preliminary treatment. The fact that copious and frequent diarrheic stools may have occurred is no contra-indication to the use of such remedies; for much offending material will usually still be evacuated by their administration and the course of the disease materially shortened thereby. To give constipating medicines in such cases is a gross error (see also the section on *Acute Catarrh of the Bowel).* A little opium and hot applications to the abdomen may in persistent cases be required as a symptomatic means to stop very severe abdominal pain.

Diarrhea due to entozoa

To the rarer forms of diarrhea of intra-intestinal origin, belong, finally, those varieties that are produced by entozoa. That the removal of parasites is a *sine qua non* of successful treatment need hardly be mentioned.

Diarrhea in infectious diseases

On the borderland between diarrhea produced by the action of irritants affecting the bowel from within its lumen and reaching the bowel through the blood, is the diarrhea seen in a variety of infectious diseases accompanied by catarrh and ulceration of the intestine. In some of them, notably in typhoid, smallpox, sepsis, erysipelas, varioloid, diphtheria, dysentery, anthrax and tuberculosis, it is often difficult to decide whether the diarrhea is due to local irritation in the bowel and the presence of ulcers or to the action of blood-borne poisons. The fact that in typhoid, for instance, profuse diarrhea often occurs long before ulcers are present, that, in cholera, no anatomic changes of the bowel are generally found despite the most profuse diarrhea, that in sepsis, malaria, influenza, pneumonia, similar relations are frequently encountered, renders it very probable that the diarrheic discharges in all these forms are in great part produced by the circulation of specific toxins through the bowel wall and the irritation of the intestinal mucosa from this source. The treatment of this variety of diarrhea is essentially synonymous with the treatment of the underlying infection and, in most cases, correspondingly successful or unsuccessful. If specific remedies are available the diarrhea can usually promptly be checked by their use; thus the diarrhea of malaria and diphtheria promptly ceases, as a rule, unless complicated by food poisoning (diarrhea dyspeptica), upon the administration of quinine or the injection of diphtheria antitoxin. The cleaning out of a septic focus, the healing of the ulcers in typhoid produces the same result without further interference directed towards checking the diarrhea. The diet, in the latter form of diarrhea, need not be modified materially on account of the existence of profuse bowel discharges. Whatever food is proper, in consideration of the primary disease, should be continued, every effort being put forward to maintain the nutrition of the patient. Fat or coarse irritating foods should be avoided. That nourishing semi-liquid and easily digestible foods should be given the preference is self-evident. The ordinary fever diet described in the Section on *Infectious Diseases* of itself answers all these requirements.

Diarrhea due to blood-borne poisons

Specific treatment

Diet

Diarrhea in uremia

To the class of blood-borne diarrheas, finally, belongs the diarrhea of uremia. This is probably caused by the circulation of ammonium carbonate which has failed to undergo proper conversion into urea. Here, too, appropriate causal treatment directed towards restoring the function of the liver (see page 488f) and promoting the renal elimination is the most important element. This diarrhea must be looked upon as a conservative process of disintoxication that it is dangerous to check by constipating remedies; for, if this is done, the vicarious elimination of circulating urinary end products and of intermediary products of perverted metabolism that the kidneys fail to eliminate properly is interfered with and the patient is often seriously injured thereby.

Diarrhea in heart disease

The diarrhea occurring in the course of heart disease, especially in the stage of failing compensation, or in portal stasis, is due to the venous engorgement or edema of the bowel wall. Here appropriate cardio-tonic medication and the use of those means that can correct venous congestion and stasis in the portal circulation is the most important element of the treatment.

Remedies

Opiates

When opium should not be given

In none of the forms enumerated, it will be seen, is the use of constipating remedies, as a rule, indicated. Occasionally opiates, as already mentioned, have to be administered for the sake of producing symptomatic relief. Opiates allay the pain and by reducing the violence of peristaltic movements check the frequency of the bowel discharges, place the bowel wall at rest and, in most cases, materially aid in enabling the irritated, usually hyperemic, intestinal wall to regain its normal state. In the dyspeptic variety of diarrhea, in diarrhea due to coprostasis and in nervous diarrhea, to be presently discussed, opium should, however, never be given. Its chief sphere of usefulness lies in the treatment of catarrhal and infectious types of diarrhea in which the evacuation of the irritating bowel contents does not bring relief and in which the patients suffer severe pain, and the nutrition is seriously interfered with. Here opium, morphine or codeine may be given; opium, in the form of the extract or the tincture, is generally more effective than its alkaloids; for the resins contained in preparations of the crude drug favor the slower liberation and absorption of the active principles of opium and hence grant a more prolonged effect in the bowel.

Bismuth
Tannin
Lead acetate
Silver nitrate

Other anti-diarrheic remedies like bismuth, tannin preparations, lead acetate, silver nitrate, etc., are indicated only in definite anatomic lesions of the bowel, and their use has been discussed in full in the part on *Acute Intestinal Catarrh* (see pages 413-418).

Heat

Heat, finally, applied to the abdomen, either in the form of moist stupes, poultices or cataplasms, or in the form of dry, hot cloths, a Leiter coil or a thermophore, or in the form of a Priessnitz or a Winternitz compress (see page 411) is always grateful, and distinctly reduces the irritability of the intestine. By relieving the pain it materially allays the subjective distress of the patient and, at the same time, in most cases reduces the number of diarrheic discharges. In the symptomatic treatment of diarrhea, therefore, immaterial what its cause, it is an invaluable adjuvant.

Nervous diarrhea

There remains for discussion an interesting form of diarrhea that must be regarded as a neurosis of the intestine, namely, so-called nervous diarrhea. It may occur acutely in predisposed neurotic or even in otherwise normal subjects following severe psychic or emotional shock, or it may be a chronic recurring condition accompanying a variety of organic diseases of the nervous system, viz.: Exophthalmic goitre, migraine and the functional neuroses, hysteria and neurasthenia. In most of the cases neurotic manifestations about the vaso-motor sphere, as sudden pallor or flushing of the face and neck, or hot flushes, vertigo, stupor, palpitation, dyspnea, various psychoses appear together with the attack of diarrhea. Nervous symptoms do not, however, invariably accompany this form of diarrhea. If it occurs in subjects who present no neurotic manifestations, the diagnosis can only be made by exclusion; from the absence, namely, of any digestive disorder, from the character of the stools and the peculiar, often highly bizarre factors that determine the attacks.

Treatment of the neurotic individual

The treatment of nervous diarrhea in a neurotic subject consists primarily in the use of the general measures applicable to the treatment of any neurosis. Here change of scene, a pause in the daily routine, life in a resort, a rest cure, suggestive treatment and all those hydrotherapeutic and electrotherapeutic measures that have been described in full in the section on *Gastric Neuroses,* are applicable. In addition any possible reflex cause, chiefly about the sexual sphere (in some women nervous diarrhea occurs chiefly during the menstrual period) and in other regions of the body must be sought for and relieved.

Diet

No special dietetic rules can be formulated for the treatment of this form of diarrhea. It will often be found that *any* change of diet is effective for a time. It is probable that here the change of regime, possibly following a change of doctors, exercises a strong suggestive effect.

Alcohol

Alcohol should be used with great moderation. It is a peculiar fact, however, that in some forms of nervous diarrhea that occur immediately after eating, a small glass of brandy or liqueur is often efficacious in warding off the attack and also in preventing the occurrence of some of the other nervous symptoms described above that frequently accompany the diarrhea.

Smoking

Rest after meals

Smoking is best prohibited. Sufferers of this kind should be advised to lie down for half an hour or an hour after each meal, with hot applications to the abdomen.

Arsenic

Of remedies arsenic is the most popular one, but I have never been convinced that it exercises any effect upon the frequency of the attacks. A strong suggestive effect is as frequently exercised by a change of medicine as by a change of diet and in some of the cases the administration of a bitter tonic, or of any placebo, is, in my experience, fully as efficacious as the administration of any of the remedies that are credited with heal-

lacebo

ing powers in this disease. In very extreme cases opium may be given in order to check the violence of the peristaltic movements, but it should be used with great care in chronic cases because, especially in these neurotic subjects, the danger of creating an opium habit must always be feared. Bismuth I have found to be altogether without effect.

Opium

Diarrhea following exposure to cold

To the same category probably belongs the peculiar form of diarrhea that suddenly follows any exposure to cold or any chilling of the body surfaces, especially when a draft strikes the neck, the feet or the region between the shoulder blades. This variety must be looked upon as due to a vaso-motor neurosis and belongs to the same class as vaso-motor coryza. The morning diarrhea, coming on suddenly with one or several profuse watery discharges about four or five o'clock in the morning before the patient gets up or immediately when the patient gets out of bed or puts his feet to the floor, must be looked upon as a nervous form of diarrhea, possibly of a vaso-motor origin and produced by the change in the temperature of the room in the early morning hours or the chilling of the body surfaces when the patient leaves the warm bed. Patients suffering from this form of diarrhea should avoid any sudden exposure to cold, should, for instance, never step on a cold floor when getting out of bed, should always wear a flannel binder and appropriate clothing and footwear, as described in the section on *Rhinitis;* they can, also to advantage, undergo a hardening process, as described in the section on *Vaso-Motor Coryza.*

FLATULENCY (METEORISM).

The causes that can produce this very distressing symptom are manifold, and in undertaking to relieve the suffering or discomfort that accrues from the abnormal accumulation of gas in the bowel, the exact cause must be looked for and, if possible, removed. When this cannot be done, or in cases in which the determining factor is chronic and irremediable in character, certain measures must be adopted that afford at least symptomatic relief. In habitual sufferers from flatulency, finally, certain prophylactic treatment can often be instituted.

Meteorism due to decreased expulsion of gas

In cases of stenosis of the bowel, in which the normal passage of gas through the intestine is mechanically interfered with; in cases of acute diffuse peritonitis, typhoid fever, pneumonia and certain other infectious diseases in which there is toxic paralysis of the bowel wall; after abdominal operations, in which the manipulation of the intestine or the shock must be incriminated with producing intestinal paresis; in general intestinal atony in which there is not paralysis, but merely weakness of the intestinal musculature; and, finally, in certain circulatory disturbances leading to venous stasis and edema of the intestinal wall, less gas than normally is expelled from the bowel so that it accumulates and produces meteorism.

Meteorism due to increased formation of gas

In other cases, again, the bowel lumen may be open, there may be no muscular insufficiency and a normal or even an increased amount of gas may be expelled from the bowel, and, nevertheless, meteorism develop. In such cases flatulency is attributable to the formation of abnormally large amounts of gas in the bowel. Here evidently one must assume that the intestine has been invaded by an exceptionally profuse or especially active flora of bacteria or of hyphomycetes capable of producing fermentation. To this group also belong many of the cases of flatulency that are seen in catarrhal disorders of the stomach and intestine for here the proper disassimilation of the food does not take place while, at the same time, the absence of the normal secretions renders the bowel a suitable nidus for various fermentative bacteria.

Meteorism due to peculiarities of bacterial flora

The diet

In treating meteorism, therefore, aside from attacking the primary cause that creates stenosis, atony or paresis of the bowel, the diet must, in every case, be regulated in such a way that especially fermentable pabulum and articles of food undergoing fermentation when eaten, i. e., containing abundant yeast cells, are excluded. Thus, vegetables containing much cellulose, like cabbage, peas, turnips, beans, potatoes; fresh bread, cakes, sweets of any kind; and of beverages, fresh fermenting liquors and drinks containing an abundance of CO_2, like beer, kephyr, champagne, aërated mineral waters, should be excluded. As milk in some subjects undergoes rapid fermentation in the bowel, it should be stopped if symptoms of flatulency appear after its administration. That the diet should, in addition, be regulated in such a way as to take into consideration the existence of a stenosis or any of the primary diseases that may cause intestinal atony, paresis or congestion of the bowel need hardly be emphasized.

Laxatives and carminatives

Provided there are no distinct contra-indications to their administration (see page 452), laxatives and carminatives are the best remedies for causing expulsion of gas that has accumulated in the bowel. Laxative remedies, by promoting vigorous peristalsis, obviously aid in the propulsion of gas through the bowel, and in addition promptly remove any fermenting material that may be stagnating in the intestine. The different laxatives that can be employed have been fully discussed in the section on *Constipation.*

Action of carminatives

The so-called carminatives comprise a large group of volatile oils and of essences, spirits, waters, tinctures, extracts and infusions containing the latter. They are useful only in mild cases of flatulency and are best given in combination with some laxative by mouth. Their action is probably that of mild laxatives and antizymotics. Besides, by mildly irritating the mucous lining of the stomach and bowel they produce a pleasant sensation of warmth and comfort that often obscures the distress experienced from flatulency, consequently their administration causes considerable subjective relief; possible, too, that their strong (and usually agreeable) smell and taste stimulates the gastro-intestinal secretions and the appetite by a nervous reflex route and hence aids digestion like the bitter tonics (see page 362). Following the administration of carminatives, eructation of gas and propulsion of gas into and from the bowel is generally produced, and this result would indicate that they actually increase the movements of the stomach and intestinal peristalsis. Whether they aid in promoting the absorption of intestinal gases into the blood is questionable. At all events, we know, clinically, that they produce marked subjective relief in most cases of flatulency and hence their administration can be recommended.

Different carminative remedies

The most common carminatives employed are preparations of cloves, anise seed, caraway seed, peppermint, cinnamon, sassafras, thyme, asafetida, lemon and orange peel, fennel, cardamoms, nutmeg, ginger and many others; or the oils themselves may be given, singly or combined, or in various combinations with bitter tonics and stomachics according to the requirements of each case. Teas prepared from the herbs and seeds containing these oils are also a very convenient household method of administering carminatives.

Remedies given to bind intestinal gases

Charcoal

Bismuth subnitrate

Magnesia usta

In addition to laxatives and carminatives, certain remedies may be administered in flatulency on account of their power to absorb and combine intestinal gases. The chief representative of this group is powdered charcoal. On account of its porosity it possesses the power of accumulating gas in its interstices. When swallowed it usually holds abundant oxygen. This is liberated in the intestine, hastening the oxydization of decomposing material, while the gases of fermentation are in their turn absorbed. It may be administered as animal charcoal *(carbo animalis)* or as vegetable charcoal *(carbo ligni)* in powder form or in the form of compressed tablets, in doses varying from sixty to one hundred and twenty grains (4 to 8 gm.) alone or in combination with bismuth subnitrate or magnesium oxide. The latter remedies are also credited with virtues similar to those possessed by charcoal. They bind a certain amount of H_2S and

CO_2 chemically with the formation of sulphids and carbonates of bismuth and magnesium.

Physostigmine

Physostigmine (eserine) salicylate, in the dose of a one hundred and twentieth to a sixtieth of a grain (0.0008 to 0.016 gm.) in pill form, or hypodermically, given two or three times a day, has been recommended by von Noorden for meteorism due to intestinal atony or paresis. The drug in such small doses can do no harm and its administration is worthy of a trial.

Colonic irrigation

Irrigation of the colon with cool enemata by stimulating peristalsis often aids in the expulsion of gas from the lower bowel. The addition of a tablespoonful or two of some carminative water, or of a few drops of oil of turpentine, to the enema is often helpful; or a long rectal tube may be introduced into the colon and kept in place for some time; in this way much gas sometimes escapes. Aspirating the gas from the lower bowel with an aspirating syringe is usually superfluous.

Rectal tube

Massage of the abdomen

Gentle massage of the abdomen performed for the purpose of stimulating peristalsis, especially in the colon, may be practised to advantage, provided no contra-indications to manipulation of the abdomen, as stenosis, ulceration, intestinal paralysis, exist.

Hot applications and liniments

Hot applications are best of all to relieve distress Turpentine stupes may be applied and sometimes aid in producing relief. Various liniments (see page 334) applied to the abdomen are also occasionally effective in relieving the subjective distress of the patient until the expulsion of gas can be promoted.

Puncture of the bowel

In extreme cases, and as a precarious emergency measure, puncture of the distended coils of the intestine with a needle trocar (see page 435) may be attempted in order to allow the escape of some of the gas from the bowel.

INTESTINAL PARASITES.

Contra-indications to tape-worm cure

TAPE-WORM.—*Tænia solium, Tænia mediocanellata, bothriocephalus latus*). In the presence of gastro-intestinal catarrh, great debility, pronounced anemia, chronic alcoholism, serious cardiac or renal lesions, a tape-worm cure should always be instituted with great care. During pregnancy, the puerperium, lactation and during the menstrual period, a tape-worm cure is best not instituted. Very little children (*status thymicus!*) and very old people seem to stand badly the rigorous treatment necessary in order to expel a tape-worm.

Preliminary treatment

In instituting a tape-worm cure the patient's intestine should be thoroughly emptied as a preliminary measure. This is accomplished by practically starving the patient for twenty-four hours, allowing only a little milk, coffee, some soup and plenty of water on the day before. The main object of this preliminary starvation is to deprive the tape-worm of the protection from the remedy he obtains if much fecal matter is present in the bowel. This object is further accomplished by administering a brisk purge, either castor oil or calomel, on the evening before the administration of the anthelmintic, followed in the morning by one or two rectal injections, provided profuse evacuations of the bowel have not been produced.

Aspidium
Granatum
Pelletierine
Pepo, Brayera

Four remedies in particular are efficacious in promoting expulsion of the tapeworm, viz.: Male fern (*aspidium felix mas*); pomegranate *(granatum)* and *pelletierine*, a mixture of several of the alkaloids of pomegranate; pumpkin seed *(pepo)*; cusso *(brayera anthelmintica)*.

These remedies are all given on an empty stomach in the following dosages:

Male fern

Male fern, as the oleo resin, in the dose of one-half to two fluid drachms (2 to 8 cc.), or as the liquid extract, in the dose of forty-five to ninety drops, preferably in a gelatine capsule. One hour after the drug is swallowed a purge is given, either the compound infusion of senna, in doses of four ounces, or two or three grains of calomel, followed within an hour by a tablespoonful of magnesia sulphate in a glass of water. Castor oil is not so useful, as poisoning from aspidium seems to occur more commonly if castor oil is given than if one of the other purgatives is administered. If within two or three hours after the administration of the purge the desired effect is not produced, a large colonic irrigation of normal salt solution should be employed; this will usually bring the worm away. If only links are secured, but no head or heads, a second or a third irrigation should be practised. If this first attempt to expel the tape-worm is not successful, at least a week or two should be allowed to elapse before a second tape-worm cure is undertaken.

Some patients become very much nauseated or even vomit after they have taken the medicine. This effect can often be prevented by having them lie down and chew small pieces of lemon or orange peel or take peppermint drops, or swallow small ice pills, or teaspoonful doses of ice tea or ice coffee.

Pomegranate

Pomegranate is best given as pelletierine in doses of two to four grains (0.12 to 0.25 gm.) in capsule or pill; or one to two ounces (32 to 64 cc.) of the decoction *(decoct. granatœ cortex)* in 250 cc. of water, taken in two portions, one hour apart, may be given; as the latter preparation is very disagreeable and bitter to the taste, it is best administered together with some flavoring syrup.

Pumpkin seed

Pumpkin seed is given in the dose of two to three ounces (64-96 gm.) of the powder suspended in an emulsion or made into a paste with sugar, molasses or honey.

Cusso

Cusso is administered by suspending half an ounce (15 gm.) of the powdered flowers in water. It is not so efficacious as the other preparations.

After treatment

The after treatment by purging and irrigating is the same, immaterial which of the vermifuges is employed.

Round worm

Round Worm.—*(Ascaris lumbricoides.)* Here, too, as in the case of the tape-worm, a preliminary starvation and purgation treatment should be instituted.

Santonin

The most trustworthy remedy to promote the expulsion of round worm is santonin. This medicine is best administered in the form of troches (Troch. Santonin U. S. P.), in the dose of one lozenge for a child, two for an adult, each lozenge containing half a grain of santonin; or the remedy may be given in solution in castor oil, but less of the remedy seems to be absorbed from the stomach if given in this menstruum than if given in tablet form. Three or four hours afferwards an active purge should be used to carry off the parasites.

Santonin poisoning

Xanthopsia

In some persons toxic symptoms appear, namely, muscular twitchings about the head, rolling of the eyes, grinding of the teeth, even epileptiform convulsions, mental confusion, nausea, vomiting and xanthopsia (yellow vision). The last named symptom occurs in most people after the administration of santonin. It need cause no alarm for it usually passes off quickly without any further treatment. It is best, however, to call the attention of the patient to the possible occurrence of this phenomenon. The appearance of the other signs mentioned above, which indicate intoxication of the central nervous system, calls for prompt evacuation of the gastro-intestinal contents by emetics and purges. The spasms, if they are severe, may be controlled by chloroform or ether inhalations.

Spigelia

Spigelia is another useful remedy to expel round worms. It should be given as the fluid extract, in doses of a teaspoonful (4 cc.) to a child, two teaspoonfuls (8 cc.) to an adult, followed by full doses of the infusion of senna, castor oil, or magnesium sulphate; or it may be administered in the form of the fluid extract of spigelia and senna, in three doses, of one teaspoonful each, given two hours apart to a child, in three doses of two teaspoonfuls given at the same interval to an adult.

Oil of chenopodium

Still another remedy that is occasionally efficacious and that may be mentioned for the sake of completeness, is the oil of chenopodium. It should be given in doses of five to ten drops

(0.3 to 0.6 gm.) in an emulsion or on sugar followed by a purgative.

Thread worms

THREAD WORMS.—*(Oxyuris vermicularis.)* This parasite finds its chief habitat in the large intestine, especially in the rectum, although, as a rule, the worms are also found in the small intestine. The parasite must, therefore, be attacked both by mouth and by rectum. Sufferers from thread worms should, therefore, receive santonin or spigelia, given in the same manner and dose as described above in the treatment of round worm, followed by a purge. In this way the parasites contained in the small intestine are destroyed or propelled into the large intestine where they can be attacked by the rectal route.

Santonin
Spigelia

Infusion of Quassia

The chief attention, however, should be directed towards ridding the lower bowel of the parasites by large medicated injections. The best medicine of all is the infusion of quassia made by adding one or two ounces (32 to 64 gm.) of quassia chips to a pint (500 cc.) of water and injecting the whole quantity, under considerable pressure, after a preliminary cleansing of the bowel with a copious warm soap and water enema. An attempt should be made to hold this injection for about five minutes. In very little children a cotton plug may be pressed against the anus in order to aid the child in retaining the medicine. Generally these injections must be repeated a number of times and on successive days and frequently at intervals for weeks. Sufferers from thread worms should be particularly careful to keep the hands and finger nails clean and free from contact with the rectum, as the parasites, and especially their minute eggs, may otherwise be carried from the rectum to the mouth, and in this way reinfect the patient.

Vinegar
Sublimate
Naphthalin
Thymol

Remedies other than quassia that are employed for attacking the thread worms in the lower bowel are vinegar in the dose of two tablespoonfuls to a litre of water; corrosive sublimate 0.01 to 100, naphthalin or thymol, each in the strength of one part to one hundred of olive oil.

Pruritus ani

The violent pruritus ani that frequently tortures sufferers from thread worms can usually be controlled by smearing blue ointment around the anus or by inserting a suppository containing from 0.1 to 0.2 gm. of blue ointment into the rectum.

Anchylostoma
Uncinaria
Thymol

The best remedy for anchylostoma and uncinaria* is thymol. After a preliminary cleaning out of the intestinal tract by starvation, purgation and irrigation, the drug should be given in gelatin capsule or emulsion in large doses, namely thirty grains (2 gm.) repeated every two hours for three or four doses, and fol-

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*Amoebic Dysentery, see under *Infectious Diseases.*

lowed five hours after the last dose by a brisk purge. If a first course of this kind does not cause the disappearance of the parasites, a second or a third thymol treatment may be given.

IV. THE PERITONEUM.

ACUTE DIFFUSE PERITONITIS.

Perforative peritonitis

Acute, diffuse peritonitis following intestinal perforation, provided the patient is seen within the first ten hours after perforation has occurred, calls for an immediate laparotomy. While an occasional spontaneous cure of perforative peritonitis is recorded, it is decidedly bad practice to count on this remote possibility and to refrain from an operation; for without an operation the patient is practically doomed, with an operation he has a chance, though a small one, of recovery. The earlier the operation is performed, the better; for in perforative peritonitis the point of perforation may be discovered and closed up and thus further contamination of the peritoneal cavity prevented; besides, free drainage is thereby established and the peritoneal cavity rid of a good deal of toxic material.

Shock no contra-indication to an operation

The preliminary shock often following perforation is no contra-indication to the operation. The development of secondary shock and collapse that is often seen in the later stages of diffuse septic peritonitis, renders the outlook more precarious, but it does not apparently render the prognosis altogether hopeless, so that here, too, a laparotomy should generally be performed.

If the symptoms of a general toxemia are not very pronounced, and if the local symptoms about the abdomen are most prominent, the chances of improvement or recovery from drainage of the peritoneal cavity by laparotomy are not bad.

Acute diffuse peritonitis a surgical disease

Acute, diffuse peritonitis, then, in the light of our present knowledge, is essentially a surgical disease. Internal measures offer very slight chances to the patient and until serum therapy shall have given us a remedy to combat the bacterial toxemia, the efforts of the medical man must be directed principally towards forestalling the occurrence of peritonitis and towards preventing, so far as that is possible, an extension of the process or an aggravation of the condition in cases that cannot be operated upon promptly. Finally, internal treatment should be directed towards supporting the patient's strength in every way in cases that cannot or will not be operated upon, in the feeble hope that spontaneous recovery may after all occur. An optimistic attitude, even in apparently desperate cases, can assuredly do no harm, and if nothing more is accomplished, the unhappy victim may at least be rendered comfortable and saved the excruciating

Object and limitations of internal treatment

tortures of body and mind that usually precede death from this horrible disease.

Rest

A patient with acute, diffuse peritonitis should be kept perfectly quiet. Most cases endeavor to do this spontaneously. Here and there, however, the pain is so great that the sufferers thrash around in bed trying to find a comfortable position. In such cases opium or morphine may be needed to enforce quiet. The best position for the patient to occupy is the dorsal with the head of the bed elevated in order to promote drainage towards the pelvic region, which is apparently more resistent to pus than other areas of the peritoneum. As a rule the patient will lie on his back with the legs drawn up. This position, if not spontaneously occupied, should be encouraged, and the legs, if needed, supported by pillows or by a support placed underneath the knees.

Opiates

Rest of the bowel

Rest of the bowel should be secured by all means. Active peristaltic movements prevent closure of the perforation and sealing of the perforative opening by peritoneal adhesions, favor spreading of bacteria through the peritoneal cavity and, above all, increase the pain. Intestinal rest should be secured as described in detail in the section on *Circumscribed Peritonitis* by a total abstinence from food during the few days of the disease, by refraining from the use of any laxative remedy, by avoiding rectal irrigations or rectal feeding and by employing opium. Opiates act as favorably on the subjective symptoms of the patient as in the circumscribed variety (dose and administration, see page 476f), by allaying the pain and by inhibiting many of the reflexes attributable to this factor, namely, vomiting, hiccup, restlessness and, to some extent, shock.

Total abstinence from food

Opiates

Thirst

Another very useful effect of the opiates, finally, in view of the danger in this disease of giving anything, even water, by mouth, is their power to allay the distressing thirst that often tortures these patients. The thirst can, furthermore, be controlled by allowing the patients to suck small pieces of ice without permitting them to swallow the water.

Subcutaneous and intravenous fluid injections

The water demands of the organism may be supplied by the injection of normal salt solution by hypodermoclysis or intravenously (technique, see index). Large quantities of fluid may be used for this purpose, as distinct advantages seem to accrue to many cases of diffuse peritonitis from this practice; for the blood pressure is raised thereby and the heart stimulated. It is possible, too, that the injection of abundant liquid under the skin and into the circulation dilutes the toxins and promotes their elimination from the body. Finally, the injection of large quantities of fluid directly into the blood vessels prevents, to some extent, the absorption of toxins from the peritoneal cavity, seems, in fact, to determine an outpouring of fluid into the peritoneal cavity. In some hospitals very large quantities, as much as ten to fifteen pints, of salt solution, are infused or injected in this way in every case of acute, diffuse peritonitis, even as a preliminary to an operation for diffuse peritonitis, and remarkably good results are reported from this plan. The method, therefore, is certainly worthy of trial, not only as a means to quench thirst and to maintain the water equilibrium of the body, but even as a curative agent.

Local applications

Inunctions

Very little can be expected from local applications. Neither continuous nor interrupted applications of cold exercise any determinable influence on the course of the disease. One must be guided in making applications to the abdomen by the sensations and the desires of the patient, and apply either heat or cold in that form that brings the most relief. Inunctions of the abdominal surface with gray ointment or with other counter-irritant salves is no longer practised. It is hard to understand how any measure of this kind can do good.

Symptomatic treatment

For the symptomatic treatment of acute, diffuse peritonitis, opiates and heart tonics are the best remedies. The former, as stated above, relieve the pain, the restlessness, the vomiting, the hiccup and, at the same time, deaden the sensitiveness of the peritoneal nerves and hence effectively counteract the tendency to initial collapse.

Initial collapse

Vomiting

For the vomiting, provided it is not controlled by opiates, i. e., either opium given by mouth or morphine administered hypodermically, a few drops of chloroform on ice or a teaspoonful of ice cold chloroform water or a dilute cocaine solution administered in frequent doses (see page 19) may be given. Priessnitz compresses applied to the epigastric region are sometimes an effective counter-irritant that controls the vomiting.

Hiccup

Hiccup can occasionally be controlled by small doses of atropine—a one hundred and twentieth to a fortieth of a grain (0.0005 to 0.0015 gm.), given either by mouth or hypodermically. This remedy is to advantage used in combination with a quarter of a grain (0.015 gm.) of morphine hypodermically, two or three times in the twenty-four hours.

Meteorism

Meteorism, if it seriously interferes with respiration and the action of the heart by pressure upon the diaphragm, is best controlled by the insertion of a soft rubber catheter into the rectum, which aids the expulsion of the gases. More active measures described in the section on *Meteorism* are hardly ever applicable.

Cardiac failure and col-
se

If signs of heart weakness or collapse appear after the disease has persisted for some days, if the pulse is rapid and of a low tension, then digitalis may be given in the dose of five drops of the tincture every few hours. Better still is adrenalin chloride, hypodermically, in doses of ten to thirty drops of a 1:1000 solution and repeated until the effect on the blood pressure becomes apparent; or adrenalin in the above dosage may be added to the large saline infusions that have been spoken of. In serious heart failure coming on suddenly the ordinary analeptics, caffein, camphor, ether, ammonia (see page 32) may have to be employed. Alcohol, too, in the form of strong spirituous liquors, given by mouth or injected in dilute form into the rectum, may serve a similar purpose. Alcohol seems to be particularly useful in profound sepsis that threatens to produce heart collapse.

Digitalis

Adrenalin

Analeptics

Alcohol

ACUTE CIRCUMSCRIBED PERITONITIS, PERITYPHLITIS, APPENDICITIS.

Classification

So far as the treatment is concerned, inflammatory and suppurative processes about the appendix and the peritoneum of the ileo-cecal region cannot very well be separated, especially as most cases of perityphlitis originate from appendiceal inflammation and as cases of appendicitis rarely run their course without some inflammation of the pericecal tissues. The treatment of acute circumscribed peritonitis in other areas of the abdomen does not differ from that of perityphlitis.

Internal therapy, which essentially means an expectant plan of treatment with rest and the avoidance of all agencies that can produce local irritation, is successful in a large proportion of cases. In other cases surgical intervention is imperative from the onset of the affection. In still other cases it is good practice to wait for definite indications before advising surgery, and, a last, fortunately small group of cases, run a rapidly fatal course uninfluenced in any way by internal or surgical treatment.

When to operate

In the management of a case of appendicitis the most difficult task is, therefore, to determine whether to operate and when to operate; to decide whether it is safe to await further developments before placing the patient on the operating table, or whether it is necessary to order surgical intervention at once in order to save life.

Critique of surgical statistics

The operative treatment of appendicitis has, without doubt, reduced the mortality from this disease. While the death rate from surgery, when the operation is performed by skilled and experienced surgeons supported by all the facilities of a modern hospital, is low, the surgical death rate is far higher in country communities, where an operation has to be performed at the patient's house, without trained attendants and by a general practitioner who constantly comes in contact with septic cases and whose experience is, of necessity, limited. Under the latter circumstances (and in this large country of ours, conditions such as those described are very general), the mortality would probably be lower if no cases were operated than if surgical intervention were practised in every case, as some surgeons advise. The voluminous statistics in favor of the operative treatment of appendicitis that emanate from large surgical hospitals, and the arguments adduced from these statistics by the master surgeons operating in each of these clinics, are consequently not applicable to practical conditions encountered in everyday medical life in smaller communities.

Conditions calling for surgical treatment

The following conditions by all means call for prompt surgical intervention:

Abscess

1. *Perityphlitic or appendiceal abscess.* This must, of necessity, be opened and drained. It is true that spontaneous rupture of such an abscess through the skin or into the bowel may occur, but, in view of the much greater probability of such an abscess rupturing into the peritoneum, it is an exceedingly precarious matter to forego surgical treatment.

Intestinal obstruction

2. *Intestinal obstruction.* Here surgery in most cases is the only means of cure. If the obstruction is due to bowel paresis occurring in the course of diffuse septic peritonitis, even surgery is in most cases unable to help and these patients die with or without an operation.

Acute perforative peritonitis

3. *Acute perforative peritonitis.* Here an operation performed without delay is sometimes life-saving, although, even in this emergency, a few instances are on record in which the patient recovered without an operation.

Diffuse peritonitis

4. Cases of *diffuse peritonitis* of one or two days' duration. These should be given the benefit of an operation; for, while most of these patients die even if a laparotomy is performed, the patient is assuredly doomed (with some doubtful exceptions that are scattered through the literature) unless the abdomen is opened.

Subacute fibropurulent peritonitis

5. *Sub-acute fibro-purulent peritonitis.* These cases offer an excellent field for surgical intervention. "The majority of cases of diffuse peritonitis cured by surgery belong to this category." (Nothnagel.)

Indications for surgical intervention

Valuable indices to guide the physician in regard to the advisability of operative interference in cases of appendicitis and perityphlitis are, the course of the temperature; the fluctuations in the pulse rate; the pain; the fluctuations in the number of leucocytes and the character of the tumor. By means of these clinical signs the presence or absence of pus can usually be diagnosed and indications for and against surgical intervention in general be formulated.

Temperature

The temperature, as a rule, depends on the character and the virulence of the bacteria causing the infection. A high temperature, i. e., 103° F. and over, persisting until or after the fourth day, generally indicates a virulent type of infection. A high temperature at the onset of the attack, even when accompanied by a chill, but disappearing by the end of the third day, may occur in simple catarrhal inflammation of the appendix and, alone, constitutes no indication for surgical intervention. Relatively low temperatures of 101 or 102°, persisting after the fifth or sixth day of the disease, render a laparatomy advisable, especially if at this period the temperature, instead of gradually dropping, rises and fluctuates rapidly within several degrees. A rapid fall of the temperature at any time of the disease should put the physician on the alert for perforation and acute diffuse peritonitis. It is well to remember that sometimes a large abscess due to the presence of bacteria that are only slightly virulent may have formed and the temperature still remain low or normal. Here other signs than the fever must be the main guide to the diagnosis and the low temperature self-evidently constitutes no contra-indication for an operation. In view of the great importance of the temperature curve in rendering a diagnosis in regard to the exact conditions present, it is clear that antipyretic drugs should never be given in appendicitis; for their administration obscures one of our most important clinical indices.

The pulse

A small, rapid, soft, pulse, especially when associated with a relatively low temperature, signs of cyanosis, cold extremities, cold sweats and diffuse sensitiveness over the whole abdomen is often indicative of acute diffuse peritonitis. A rapid, bounding, full pulse, on the other hand, associated with a correspondingly high temperature, severe and strictly localized pain, particularly within the first two or three days of the disease, is not necessarily an indication for a laparotomy, and it is usually safe to treat such cases, under careful supervision, by internal means. A sudden change in the volume and the tension of the pulse, of course always constitutes a serious warning of impending danger.

The pain

The pain is a very unreliable symptom and one that I am in the habit of neglecting when attempting to arrive at a decision in regard to the advisability of operating. Especially if the opium treatment is employed (see below) the pain is dulled and this symptom eliminated from consideration altogether. Moreover, very mild attacks of appendicitis may be accompanied by very severe pain, and exceedingly grave attacks by slight pain or no pain at all. Very much will depend on the individua sensibility of the patient, the presence or absence of much fecal material causing distention of the bowel and other quite uncontrollable elements. A very severe sudden pain in the ileo-cecal region should, of course, always arouse the suspicion of a perforation. Gangrene of the appendix, one of the most dangerous complications, is often accompanied by very slight pain or no pain at all; for "a dead appendix feels no pain."

The leucocytes

If the examination of the blood shows a high degree of polynuclear leucocytosis, increasing steadily, this generally indicates pus and renders a laparotomy advisable. Too much reliance should not, however, be placed upon this sign; for very serious, distinctly surgical forms of appendicitis are encountered in which this progressive increase in the number of leucocytes does not occur.*

The tumor

A steadily growing tumor in the ileo-cecal region, or a swelling the size of which remains stationary after the fourth or fifth day of the disease, especially when associated with a high, persistent fever, and an increase of the leucocytes, in most cases indicates an abscess and calls for surgical intervention. If leucocytosis and a high fever are absent, and if the tumor is not especially painful, a preliminary irrigation of the colon with small amounts (200 cc.) of lukewarm water may safely be attempted and the tumor, if it is fecal in character, will sometimes promptly disappear under this treatment, the temperature drop and the meteorism vanish. I have never considered it safe, under any circumstances, however, to give an internal laxative on the suspicion that the tumor might be fecal in character, especially if there was much fever and a high leucocyte count.

Difficulties of arriving at a decision

It will be seen, therefore, how exceedingly difficult it is to arrive at clean cut indications for surgical intervention in this disease. No absolutely fixed rules for or against an operation can be set down, and each case must be judged separately. On the one hand, as stated above, an apparently simple case may lead to perforation or gangrenous rupture of the appendix with acute peritonitis; on the other, an apparently very severe case may progress toward complete resolution without surgical intervention. Here and there a case would have been saved had an operation been performed at once. Here and there, on the contrary, a case would have lived had operative interference not been attempted, for the administration of an anesthetic, the excitement, the fear and the shock of an operation, not to speak of the diffi-

Advantages and disadvantages of surgical and medical treatment

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*The clinical significance of a sudden drop in the leucocytes is not clearly established.

cult manipulation of an inflamed, or adherent or fragile appendix or cecum, are by no means negligible elements. If the case, moreover, heals without an operation, convalescence is more rapid and there remain none of the disagreeable sequelæ of fecal fistula, broad adhesions, etc., that may follow any laparotomy performed during the acute stage of appendicitis or perityphlitis. I am inclined to the belief that more cases are destroyed by unnecessary surgical intervention, especially in country practice, than would be sacrificed for lack of an operation, particularly if the proper internal treatment to be now described is instituted and the patient is very carefully watched all the time for the appearance of definite surgical indications.

Internal treatment

Rest of the patient

Complete rest of the patient is one of the most important elements of the treatment. The patient should remain on his back with the right leg drawn up and preferably supported under the knee by a pillow or two; the body should be slightly raised or the whole head of the bed elevated; in this way drainage into the pelvis is promoted in case perforation should occur. This is an important element, because the pelvic peritoneum, especially in women, is singularly resistent to pus infection. The patient should not be allowed to get up under any circumstances, nor should he be permitted to perform any violent movements in bed. Defecation and urination should be performed with the aid of the bed pan and the urinal, and the patient should be lifted upon the bed pan by attendants and not allowed to raise himself. The patient should remain in bed for at least five to ten days after the disappearance of all acute symptoms, the fever and local signs. If these precautions are not carried out, delicate peritoneal adhesions that are thrown out in the inflamed area are apt to be torn and dangerous complications engendered thereby.

Rest of the intestine

Abstinence from food

Thirst

The intestine, too, should be placed completely at rest. If there is nausea or vomiting, complete abstinence from food for one, two or three days is a very good plan. As the patients generally become very thirsty under this total abstinence, small pieces of ice may be sucked or the mouth may be frequently rinsed with some antiseptic solution, a little peppermint water or soda water, or the patient may be allowed to chew a little gum. In some cases water, given in teaspoonful doses every hour or so, can, however, do no harm, as all of the water is absorbed in the stomach or in the first part of the intestine, and as the ingestion of water only very slightly stimulates bowel peristalsis.

Diet during first days

After forty-eight hours, provided there is no more vomiting, a little milk, in doses of a tablespoonful or two, may be administered every two or three hours, or a little meat broth with an egg stirred into it, or some thin, strained gruel made of boiled milk and barley, wheat, oatmeal flour or sago, arrowroot, tapioca may be permitted in small doses. If milk is distasteful to the patient or is not well borne, especially if it produces flatulency, it should be stopped and gruel made of water and the above flours, soups and broths alone should be given.

Diet after a week

After a week or ten days, provided all acute symptoms have disappeared, a soft boiled egg, some mashed potatoes, some vegetable purées, a little very finely chopped sweetbreads, chicken or mutton, may be administered, and, then, very gradually, a solid mixed diet resumed, omitting all those articles from the bill of fare that contain spices or condiments, that produce much fermentation in the bowel or that leave a coarse, indigestible residue.

Nutritive enemata and bowel irrigation

Nutritive enemata are rarely required and best avoided altogether. The injection of lukewarm water into the lower bowel for the purpose of supplying some water to the body is rarely necessary during the first few days, especially if the patient is allowed to take a little water by mouth, as indicated above; in fact, the injection of fluids into the rectum is, in most cases, a somewhat precarious procedure and one that is best avoided. Later in the disease and under the conditions outlined in another paragraph, injections of small quantities of lukewarm water given for the purpose of dissolving fecal masses in the colon and cecum may be administered and an ileo-cecal tumor due to fecal accumulation may sometimes be caused to disappear thereby.

Opium

In order to bestow complete rest upon the intestine the sovereign remedy is opium. Many surgeons object to its use in this disease as well as in intestinal occlusion (see page 430), on the ground that it obscures symptoms, causes valuable time to be lost, lulls the patient and the physician into a sense of false security.

Objections to opium

These objections are invalid if the temperature, the pulse, the leucocytes and changes in the tumor are carefully watched. The pain, it is true, is obscured, but, as indicated above, this symptom is the least important of all the signs of appendicitis and perityphlitis, the least constant and the least reliable index of the actual conditions existing.

Advantages of opium

Under opium the local rigor of the abdominal muscles becomes much less intense, and palpation of the tumor or its recognition, as the disease progresses, much easier. This is very important from the standpoint of diagnosis and for the purpose of determining the exact time of an operation, should surgical intervention become necessary.

Unless one accepts the standpoint, therefore, that every case of appendicitis or perityphlitis should be treated surgically, opium is a most useful adjuvant to the treatment; for it effectually inhibits peristalsis and hence materially reduces the danger of perforation and extension of the process to larger areas of the adjacent peritoneal coverings. Opium, too, if properly administered, stops the vomiting and the nausea and by constipating the patient renders defecation unnecessary. These are all advantages inasmuch as they prevent periodical increase of the abdominal pressure and, above all, the necessity of the patient sitting up in order to vomit or to deposit the stools. Lastly opium aids in reducing the sensation of thirst, not to speak of its quieting effect on the patient's mind.

Effect on pain, vomiting, nausea, thirst

Dose

The dosage should be regulated chiefly by the sensations of the sufferer. Just enough and not more should be given to stop the pain and to keep the patient comfortable. When the pain disappears, opium should be discontinued, only to be administered again when the pain reappears. If no pain is present or if it is minimal, one can get along very well with very little opium. If there is no gastric irritation with nausea and vomiting, tincture of opium may be given by mouth in the dose of five to ten drops in a little water every two hours until the desired effect is produced. If there is vomiting or nausea, opium is better given in suppository in two or three doses of one-half grain (0.1 gm.) of the extract, or, finally, if neither method is well borne, opium may be given hypodermically in the following preparation:

Extract opi. liq.	1
Water	20

This amount may be injected two or three times a day. The solution should be freshly prepared and injected subcutaneously with particular aseptic precautions. Morphine, in the dose of a quarter to a half grain (0.015 to 0.03 gm.) may sometimes have to be given in place of opium, twice or three times a day, hypodermically. Opium, however, is far better than morphine, as it is much more effective in inhibiting intestinal peristalsis than morphine. Wherever feasible, opium in the form of the tincture or the extract should be given by mouth.

Duration of opium treatment

The opium treatment should be continued for about a week after the acute symptoms have disappeared. The constipation that results from the opium treatment is negligible, even if there are no bowel movements for six or seven days, especially as no food, leaving a residue, is eaten. Even if no opium is taken no attempt should be made to move the bowel by laxatives. When the time has come for cleansing out the bowels gentle irrigation should be practised, but no purgatives should be administered.

Constipation negligible

Danger of purging

Formerly when the belief was prevalent that appendicitis was due to fecal accumulation (stercoral typhlitis) purging was generally resorted to throughout the course of the disease, and I have no doubt that much serious harm was done in that way. There is too great a tendency on the part of the patients and often the physician to insist on a bowel evacuation every day; and possibly one of the most difficult tasks that the practitioner is confronted with is to convince the patient and, above all, his friends, that no harm can arise from locking the bowels for a week if necessary in these cases, and I quote no less authority than Nothnagel in support of this view: "Even constipation lasting for a week is useful and does no harm."

Local measures

Ice bag

Hot applications

Priessnitz compress

Leiter coil

Of local measures the ice bag is the best in most cases. If the weight of even a small bag is disagreeable to the patient, the ice bag may be supported from a string, stretched from the head to the foot of the bed, so that the bag gently rests over the appendiceal region. One of the great advantages of this plan is that the patient must keep perfectly quiet in order to hold the ice bag in place. Some local treatment should, in every case, be instituted if for no other reason than to convince the patient that something active is being done for him, and the quieting psychic effect of an ice bag cannot be overestimated. Some patients feel better with a hot water bag or hot compresses, but I prefer cold throughout; at least, by all means, for the first five days. If cold is very disagreeable, and some patients, it will be found, complain bitterly of cold, cool Priessnitz compresses or a Leiter coil charged with cool water may be used instead. After the most acute symptoms of the disease are over, heat may be applied in the form of hot poultices, a Leiter coil charged with hot water, large Priessnitz compresses or a Winternitz compress (see index). It is very doubtful whether heat exercises any determinable effect on the absorption of perityphlitic exudates.

Counter-irritants to be avoided

Other local measures are of very little value. Counter-irritants, blistering, painting with iodine, leeching, etc., are best eschewed. They do no good in so far as affecting the process is concerned. Occasionally they relieve the pain somewhat, but this property need not be utilized when the opium treatment is being instituted. The chief disadvantage accruing from their use is that they injure the skin and hence render greater the possibilities of stitch abscesses, or even deeper pus infections in case an operation becomes necessary.

Hydrotherapy to be avoided

Bathing or other hydrotherapeutic measures are distinctly harmful during the acute stage of the disease; for, during the first few days, absolute rest is the prime requisite. A sponge bath gently administered in bed, sponging each extremity separately with soap and tepid water for purposes of cleanliness, can do no harm, but even this is best omitted during the first few days. For reducing the temperature, cool sponging is never to be instituted in this disease, as no attempt should be made to reduce or modify the temperature, because temperature fluctuations are one of our chief indices of the course of the disease and the advisability of operating.

Massage to be condemned

That massage of the appendiceal region should never be performed during the acute stage need hardly be emphasized. Just what one might expect to accomplish thereby it is difficult to understand. The proceeding is quite commonly followed, but must be condemned as immensely dangerous. During convalescence it is altogether superfluous and generally fraught with danger; for the fine peritoneal adhesions that act as a protective covering over the inflamed area are very apt to be torn by manipulation from without. I do not believe that the absorption of large masses of exudate even later in the disease is in any way hastened by abdominal massage.

After treatment

Diet

Colonic flushings

Avoidance of violent exercise

The after treatment of peritonitis and perityphlitis must concern itself chiefly with an attempt to prevent a recurrence of acute attacks. The diet should be regulated in such a way that no irritating or indigestible foods are eaten. In order to prevent fecal stagnation in the cecum, bi-weekly high colonic flushings and an occasional dose of castor oil may be given, although it is well known that free daily bowel movements by no means prevent the recurrence of appendicitis. Particular care should be taken not to indulge in violent exercise of any kind. The patient should lead a quiet life and should indulge in no out-door sports. Massage of the abdomen, as stated above, should be forbidden.

The interval operation

Despite all these precautionary measures recurrences appear in a certain proportion of the cases, so that one must always think of the advisability of an operation for the removal of the appendix after the first or subsequent attacks.

Advantages of interval operation

Whereas an operation during the acute stage must always be considered an emergency measure and one that is never devoid of danger, the interval operation, which is becoming deservedly popular, may be regarded as a conservative surgical inroad and one of the safest operations. Moreover, it constitutes the most effective and, in many cases, the only means of preventing the recurrence of attacks of appendicitis. Nevertheless, even this operation should not be advised as a routine measure, for there is nothing more horrible to contemplate in the retrospect than the death of an apparently healthy individual from an anesthetic or from shock or from some unforseen complication that may

Objections against interval operation

arise in the course of an operation in which the appendix is removed as a prophylactic measure. Besides, one can never predict with absolute certainty that a second attack will occur; for only about twenty to twenty-five per cent. of all cases of acute appendicitis suffer a second attack. As a rule, and unless special reasons (see below) render it necessary to perform the interval operation after the first attack, I prefer to wait until a second attack has occurred and then, by all means, recommend removal of the appendix before a third relapse can supervene. This plan also generally appeals very strongly to the patient, for most people will be very apt to imagine that they will constitute one of the lucky seventy-five to eighty per cent. of the cases who do not have a relapse and they will persist in this belief until the second attack convinces them that they belong to the unfortunate minority.

Indications for interim operation

Under the following circumstances, however, an interim operation is advisable:

Frequent recurrences

First—When, as stated above, the patient shows a tendency to relapses at frequent intervals, immaterial whether the recurrent attacks are light or severe; for the fact that new attacks supervene despite all care indicates that the local tendency to healing and the conditions for a restoration to a normal state are bad and that ablation of the diseased parts whose vitality, i. e., resisting powers are, in most cases, materially reduced, is the only effective means of securing permanent relief.

Adhesions

Second—When the existence of adhesions or of a tumor mass in the ileo-cecal region can be determined, which causes pain or signs of stenosis of the bowel lumen with constipation (see section on *Intestinal Stenosis*). Occasionally, it must be remembered, adhesions in the appendiceal region cause pain referred to other regions of the body, as the gall-bladder, the stomach, the urinary bladder, simulating diseases of these organs. In such cases, too, surgical treatment of the local conditions in the ileocecal region frequently brings relief from these symptoms.

"Reflex" irritation in neurotic or reduced individuals

Third—If the diseased region about the appendix constitutes a source from which (more or less hypothetical) "reflex" irritation emanates, sufficiently severe to cause functional gastric or intestinal disorders and derangements in or about remote organs. This event presumably occurs only in neurotic or reduced subjects; also in psychopathic individuals who have heard much of operation for appendicitis and the dangers of the disease if it is not operated upon. In such subjects a very pronounced condition of hypochondriasis is commonly engendered even by mild discomfort or pain in the appendiceal region. The mental suffering is very real and the conditions can often only be relieved by an operation. Such individuals, in fact, insist on an operation themselves, present themselves to the surgeon rather than to the internist with the demand for surgical intervention and are quite satisfied, even if the appendix, as is very often the case, is found after removal to be in a normal or approximately normal condition.

A discussion of the technique of surgical intervention and the indications for the different possible surgical measures that can be employed does not lie within the frame of this volume.

CHRONIC PERITONITIS AND TUBERCULOSIS OF THE PERITONEUM.

Classification

There are rare cases of chronic (exudative or indurative and adhesive) peritonitis that are not due to tuberculosis, but most of the cases encountered are tuberculous in character. In addition there is a carcinomatous form of chronic peritonitis that in its nature is hopeless and in which treatment is purely symptomatic and must be directed against the pain, the ascites, etc.

Spontaneous recovery

Internal treatment

Surgery

In the other varieties of chronic tuberculous and non-tuberculous peritonitis, spontaneous recovery occasionally takes place. Every effort should, therefore, be put forward by the physician to aid Nature in this endeavor by creating ideal surroundings for the patient, insisting upon rest, the proper diet and hygiene and by symptomatically relieving distressing symptoms as they may arise. Surgery, too, occasionally aids in the treatment of chronic peritonitis. Inasmuch as the treatment of the rare, non-tuberculous variety of chronic peritonitis does not differ materially from that of the tuberculous, the latter alone may be discussed.

Rest and fresh air.

A patient suffering from chronic tuberculous peritonitis should remain in bed completely at rest, preferably in the open air or in a thoroughly ventilated room. If it is at all possible the patient should be removed to a warm, sunny, equable climate. In the treatment of this disease the same rules, broadly speaking, should be inaugurated as in the management of any other form of tuberculous infection. These rules, as well as the limitations of the fresh air treatment and the contra-indication to its routine use have been fully described in the section on *Pulmonary Tuberculosis*, and need not be repeated in this place.

Diet

That the diet should be as nutritious and as non-irritating as possible is manifest. The selection of the food will have to be governed largely by the state of the digestive function and the amount of exudate present in the abdomen. Rectal feeding (see page 368) is, in many cases, a very useful means of supplying food values that cannot safely or with comfort be incorporated by mouth.

External measures

It is somewhat difficult to render conservative judgment in regard to the efficacy of various external measures that are employed in the treatment of tuberculous peritonitis; for there is in this disease a marked tendency to fluctuations in the severity of the manifestations and to spontaneous recovery, so that the results obtained from various therapeutic measures are never free from ambiguity.

As none of the measures to be presently enumerated can do any harm and as a larger proportion of cases seem to recover under their use than without them, they should be tried in every instance.

Inunction with green soap

A popular measure, adopted in nearly all large clinics, is inunction of the abdominal surfaces with potash soap (*sapo kalinus viridis*). The soft soap is applied by stirring about a teaspoonful with a little warm water to form a thin paste and rubbing this into the skin of the abdomen. After about half an hour the soap is washed off with lukewarm water and the skin carefully dried and powdered. This treatment is repeated every evening. As soon as irritation of the skin and eczematous eruptions, etc., appear, the soap is no longer applied to the abdomen, but in the same manner to the skin in the lumbar region, the back or the buttocks, until the abdominal skin is healed, then it is reapplied to the abdomen. This treatment is often followed by rapid absorption of the peritoneal exudate. Generally, it is true, a thickened omentum or mesentery or massive adhesions remain behind.

Mercurial ointment

Instead of green soap, mercurial ointment may be applied in the same way, but it does not seem to be as efficacious in so many cases as soap, nor is inunction with this ointment, especially if continued for a long time, to be considered an altogether harmless or indifferent procedure.

Bandaging

In order to promote rest of the abdomen, light bandaging is useful. This practice also often affords considerable relief from pain; it has no determinable effect on the absorption of the exudate.

Compresses

Priessnitz compresses, hot fomentations or poultices may all be applied for producing symptomatic relief, but they cannot be credited with influencing the peritoneal process itself in any determinable way.

Diuretics

Diuretics are commonly administered for the purpose of draining off fluid from the peritoneal cavity. This practice is a rational adjuvant to the treatment, provided too much is not expected from increased diuresis. Any of the diuretic drugs mentioned in previous sections (see index) may be employed for this purpose.

Indications for surgical intervention

If rest, proper hygiene and diet combined with inunctions, bandaging, the use of compresses and diuretics do not produce recovery within a reasonable time; if there is much pain, fever, diarrhea and no reduction of the ascites and, above all, if the patient continues to fail, to emaciate, then recourse must be had to surgery. It is a safe rule not to persist in non-surgical treatment for longer than two months, provided no improvement becomes manifest during that time. If it should be found that the patient rapidly grows worse under internal measures, then a laparotomy should be done still sooner.

Time of operation

Incision and drainage of the peritoneal cavity

The proper operation is incision and drainage of the peritoneal cavity. Paracentesis with drainage or aspiration of the ascitic fluid, or simple puncture do not yield such favorable results. If the primary focus of infection can be discovered (especially about the female genitalia, an intestinal ulcer, degenerated lymph glands) it should be removed. And if the existence of such a focus and its location can be suspected or positively diagnosed in advance, the laparotomy incision should, self-evidently, be made in the region of the abdomen where the diseased area is located. In cases of tuberculous peritonitis of obscure origin, it is always good practice to explore the female sexual apparatus after laparotomy; for the primary focus of the disease will often be found about these parts. Cases of tuberculous peritonitis with and without exudate are amenable to treatment by laparotomy, although the results in the former variety are much better.

Exploration of female genitalia

There are no distinct contra-indications to the operation, provided it is looked upon as a resort to be adopted only, as stated above, when internal measures have been tried in vain; in other words, after conditions have been created and maintained for a sufficient length of time that might have favored a spontaneous cure, but failed to do so.

Prognosis under internal and surgical treatment

A considerable proportion of the cases will be found, as already indicated, to recover under expectant treatment. Of those that do not improve a certain number will die with as well as without an operation, and a certain proportion will recover after a laparotomy who would not have recovered without it.

Contra-indications to surgical intervention

Unless the patient, therefore, is in an advanced stage of general tuberculosis or suffers from so serious a type of pulmonary or intestinal tuberculosis that it in itself renders the prognosis hopeless, the surgical treatment of chronic tuberculous peritonitis should be given a trial in every case of the disease that does not yield to medical treatment.

CHAPTER IX.

DISEASES OF THE LIVER AND BILE PASSAGES

CATARRHAL JAUNDICE.

Treatment of gastro-intestinal catarrh

The treatment of catarrhal jaundice, especially in the beginning of the disease, is essentially the same as the treatment of the gastro-intestinal catarrh that produces the disorder. As the treatment of this catarrh has been discussed in full in previous sections, it need not be repeated here.

Purgation by castor oil, calomel, salines, colonic flushing

Purgatives not to be employed

As a rule the icterus does not develop until several days after the onset of the gastro-intestinal disorders (although in exceptional cases it occasionally precedes them), so that, as a rule, cleaning out the stomach by lavage or by the use of an emetic is superfluous and the chief attention should be given to ridding the bowel of any irritating or poisonous material it may still incorporate. For this purpose a brisk purge, best of all, three to five grains (0.2 to 0.3 gm.) of calomel, or castor oil, followed by a large dose of sodium phosphate or of magnesium sulphate and a colonic flushing, should be given at once upon the appearance of icteric symptoms. Such remedies as podophyllin, rhubarb, jalap, convolvulin, scammony, gamboge and cathartic acid should not be used as purgatives in this condition, because they seem to be practically inactive if bile is absent from the bowel.

Diet in the beginning

Rest in bed

As soon as evidence of acute gastro-intestinal dyspepsia is present, the patient should either refrain from food altogether or should be allowed to take only a little milk, some thin soup or strained gruel and water. During this period and until the tongue is clear. the fever normal and the epigastric or abdominal discomfort is gone, the patient is best kept in bed.

Regime after disappearance of dyspeptic symptoms

With the disappearance or the mitigation of dyspeptic symptoms, the diet should be made more liberal and the patient allowed to get up a little each day. Some patients, in fact, are able without discomfort to attend to their daily work without displaying any other signs of illness than the yellow discoloration of the skin or sclera. Others, again, feel so ill throughout the course of the disease that they are forced to remain in bed for long periods of time. This occurs particularly in patients who develop, consecutively to the catarrhal swelling of the bile ducts, a condition of hepatic insufficiency (see page 488) with symptoms of profound self-intoxication.

During the whole period of bile duct occlusion or obstruction the diet should be carefully regulated to take into consideration the absence of a normal amount of bile from the small intestine.

Exclusion of fats

Fats should be excluded from the diet, because their emulsification and saponification, hence their absorption, is always seriously interfered with, so that they travel through the intestine in an undigested form, undergo abnormal decomposition by intestinal bacteria, with the formation of poisonous and irritating products and hence increase the catarrhal irritation that originally caused the trouble. Inasmuch, moreover, as in many cases of catarrhal icterus the pancreatic duct is in all probability also stenosed or occluded by catarrhal swelling (as manifested by the appearance of abundant undigested meat fibers, fat and starchy granules in the stools and sometimes glycosuria) fat is especially contra-indicated.

Albuminous foods and carbohydrates

General character of the diet

The chief food, therefore, in catarrhal jaundice should be albuminous material to which may be added easily digestible carbohydrates, preferably dextrinized starchy foods and sugars. All food should be administered in an easily digestible form (see page 347), in the beginning, chiefly as liquid and semi-liquid articles, namely broths, thin gruels, milk, buttermilk, meat jellies, gelatinous foods, very soft boiled or poached eggs; later finely chopped raw or rare beef, mutton, poultry, fish, a little zwieback, toast or crackers soaked in milk, gruels made of milk and rice or barley, arrowroot, tapioca, sago, etc. All foods containing coarse and indigestible particles, like skins and tendons, husks, seeds, stems, pips, should be withheld for a long time. Alcoholic beverages are to be altogether forbidden.

Predigested foods

In case the pancreatic duct is occluded, too (see above), the digestion of albumens also suffers. In such cases the patients usually display a strong aversion for meat, and it should not be forced upon them. Here albumoses and peptones, various predigested foods, peptonized milk, etc., as well as certain of the easily digested vegetable albumens, can be utilized to advantage.

Alkaline and alkaline-saline mineral waters

Abundant water drinking

Alkaline and alkaline-saline waters play an important part in the treatment of catarrhal jaundice. Their exact mode of action is not quite clear. It has been claimed that the alkalies they contain are excreted through the bile ducts and exercise a beneficial effect on the congested mucous lining of the bile channel. It is more probable that they favorably influence the catarrh in the small intestine and reduce the swelling around the bile duct orifice and hence aid in restoring patency of its lumen. The large amount of water that is ingested and absorbed might even be imagined to dilute the bile and hence render its outflow through the narrowed bile ducts easier. Whereas this effect of abundant water drinking is somewhat problematical, the limitation of water drinking certainly leads to thickening of the bile, an event that is to be energetically counteracted. Mineral waters at all events aid in dissolving some of the mucus accumulated in the bile ducts and hence act beneficially. Whatever the exact action of alkaline or alkaline-saline mineral waters, or of plain water, may be, clinically it may be considered established that the abundant ingestion of such waters, especially when they are taken warm and at frequent intervals, materially aids in restoring normal conditions in catarrhal jaundice.

Intestinal irrigations

Intestinal irrigation with large quantities of water also exercises a useful effect, so that frequent enemata should be ordered in combination with copious water drinking. The injection daily by clysma of one or two quarts of cold water is a very popular and a very useful measure. The increased peristalsis of the intestine combined presumably with increased contractions of the gall-duct musculature that is stimulated by such injections, aids in the expulsion of mucus and bile from the bile passages; moreover, the circulation in the whole portal system, and hence in the liver, is accelerated by such injections, while nervous reflex stimuli must also be imagined to travel to the liver from the lower bowel. All these factors aid in causing a decrease in the swelling of the bile-duct lining, in expelling the mucus and in re-establishing the flow of bile.

Finally, the mechanical distention of the colon which is brought about by the injection of large quantities of water may exercise some traction on the region about the bile-duct orifices, and hence, too, stimulate contractions of the latter.

Whereas all these explanations of the exact action of large, cool colonic flushings are more or less hypothetical, clinical experience, as in the case of copious water drinking, shows them to be actually useful.

Cholagogues

Salicylates

Bile acids

In order to stimulate the flow of bile towards the intestine various cholagogue remedies were formerly employed. As a matter of fact, however, only two drugs can be definitely credited with the power to stimulate an increased flow of bile, viz., preparations of salicylic acid and of bile acids. All the other so-called cholagogue remedies act merely as purges and the appearance of bile in the stools after their administration must be attributed to the abnormally rapid propulsion of the contents of the small intestine into the lower bowel, rather than to any stimulation of the bile flow. This subject will be referred to again in the Section on *Cholelithiasis*. In catarrhal icterus the use of cholagogue remedies is not indicated; for the slight increase of the pressure [illegible] may be brought about by [illegible] can hardly be considered effective [illegible] the resistance offered to the outflow [illegible] swelling of the bile duct mucosa. More[illegible] back pressure within the bile-ducts reaches a [illegible] point, the manufacture of bile by the hepatic [illegible] inhibited. Before this occurs stimulation [illegible] will probably lead rather to increased diapedesis [illegible] from the bile channels into the blood channels, which [illegible] than to an exit of the bile into the bowel through [illegible] bile ducts.

[illegible] acids, however, serve a useful purpose in ca[illegible] as well as in certain other forms of obstructive [illegible] their administration a certain amount of bile [illegible] small intestine and thereby intestinal digestion [illegible] the same time a mild intestinal antisepsis is [illegible] answers the latter purpose. Both bile and [illegible] acid preparations, however, should be given [illegible] doses [illegible]

[illegible] complicating catarrhal icterus, intense itching [illegible] relief. Here a variety of measures must often be [illegible] efficient remedy is discovered, and it will gen[illegible] that the remedies that are helpful at first soon [illegible] relieve, so that frequent changes or alternation [illegible] required. Lukewarm baths, cold sponging, alcohol [illegible] the skin with cocoa butter or lanolin all occa[illegible] One of the best remedies is menthol applied in [illegible] the strength of one to five, or in the form of [illegible] the proportion of one part of menthol to five [illegible] or as an ointment consisting of

[illegible] or as an ointment consisting of menthol, one [illegible] two parts: lanolin, twenty-five parts.

[illegible]ONIC INFLAMMATION OF THE LIVER.

[illegible] HYPERTROPHIC CIRRHOSIS, CARDIAC, BILIARY CIRRHOSIS, [illegible] HEPATITIS, HEPATIC INSUFFICIENCY

[illegible] insufficiency is an important symptom [illegible] a [illegible] of hepatic disorders and leading [illegible]

[illegible] in part from my article on [illegible] consequences to complications about remote organs of the body. Its general pathogenetic significance and the means at our disposal for correcting hepatic insufficiency may therefore be treated of in this place, especially as a connected discussion of hepatic insufficiency will obviate the necessity of reviewing separately the treatment of the different organic lesions of the liver that produce this symptom.

Hepatic insufficiency

Whenever an organ fails to perform its functions properly we say that it is insufficient. This term may denote both qualitative and quantitative variations from the normal. The more complicated and the more active the functions of an organ the more liable it is to insufficiency. The liver, therefore, possessing as it does the most manifold functions of any organ of the body, is particularly subject to functional derangements. Its exposed situation, moreover, and the peculiar arrangement of the four systems of capillaries that form an intricate labyrinth around and through each hepatic cell render the latter especially liable to injury by circulating toxins. These poisons reach the liver cells continuously from the general circulation in the hepatic artery, through the lymphatic circulation (especially from the peritoneum), the portal circulation and the bile channels.

Causes

One may differentiate for clinical purposes between mechanical, parasitic, and toxic causes of hepatic insufficiency, remembering always that the three may be and usually are, correlated and intimately connected.

Mechanical causes

Cirrhosis

Thrombosis

Bile duct occlusion (biliary cirrhosis)

Heart lesions (cardiac cirrhosis)

Chief among the mechanical causes are all sclerotic changes causing overgrowth or contraction of interstitial liver tissues and thereby producing mechanical compression of liver cells or of their afferent blood-vessels. Then there is mechanical stenosis, occlusion or obliteration of large blood-vessels by embolism, thrombosis, or pressure from without, causing similar nutritional changes, and, later, necrosis of large areas of liver cells. Again, the bile-ducts of the liver may become similarly narrowed or occluded by biliary concretions or by the invasion of these channels from without by parasites, in either instance producing stagnation of bile and mechanical compression of liver cells or of the blood-vessels that nourish them. Finally, certain heart lesions must be included among the mechanical causes, for, by producing stasis of venous blood in the capillaries of the liver, they, too, exercise mechanical compression upon the hepatic cells and cause derangement of their function.

Parasitic causes

As has been intimated, the parasitic causes of hepatic insufficiency occupy an intermediary position between mechanical and toxic causes, for any micro-organism that invades the liver channels or the liver tissues proper may act either as a foreign body by mechanically destroying liver cells by pressure or by occluding the blood-vessels or bile channels, or it may lead to the formation of chemical poisons that intoxicate the liver cells.

Toxic causes

The toxins, finally, that can produce hepatic insufficiency are so manifold that it would be useless to attempt to enumerate them in this place. It is sufficient to say that all the poisons generated in the bowel, the spleen, or the pancreas must travel first to the liver before they can reach the general circulation beyond; that all the manifold array of metabolic poisons that can be formed in the system at large always comes into particularly intimate contact with the liver cells owing to the intricate interlacing of the capillaries of the hepatic artery and the hepatic lymph-channels in the liver. Finally, the liver, possessing as it does a most active metabolism of its own, continually manufactures toxic intermediary bodies within its substance; and this is particularly the case if its function is in any way deranged.

General symptomatology

The changes that the liver may undergo as a result of all these causes may vary from mild transitory functional derangements to destructive histological lesions of the hepatic cells. The symptoms of hepatic insufficiency are, therefore, very numerous. This is self-evident when we consider the many functions of the liver, any one of which may become qualitatively or quantitatively perverted. Our knowledge of the finer mechanism of the intermediary metabolism going on within the liver is, however, still so woefully incomplete that it is unfortunately well-nigh impossible to interpret slight derangements of many of these functions correctly. For this reason we are as yet unable to recognize as early as we might wish the first manifestations of hepatic insufficiency, as we can, for instance, recognize early functional changes of the kidneys in the urine, or mild derangements of the stomach function in the gastric contents long before anatomical lesions supervene. From the standpoint of prophylaxis and therapy this is particularly deplorable.

In order to understand the symptomatology of hepatic insufficiency and to treat it properly it is necessary to have a clear understanding of liver physiology, because it is manifestly impossible to understand the pathology of any group of functions unless we understand their physiology; to appreciate or correct the abnormal until we understand the normal.

The normal function of the liver may be summarized under the following five heads: (1) formation of urea; (2) conversion of sugar into glycogen and the storage of the latter; (3) formation of bile; (4) elaboration both by anabolism and catabolism of circulating radicals of the fats and albumen; (5) general disintoxication of circulating poisons and the formation of antitoxic bodies.

Perversion of these five mentioned functions must lead to the following results:

Decreased urea formation

(1) A diminution of the circulating urea and a flooding of the blood-stream with bodies that have failed to undergo conversion into urea in the liver, notably ammonia salts and amido-acids, with the appearance of corresponding urinary symptoms—i. e., a decrease of the urinary urea and a corresponding increase of the urinary ammonia and amido-acids. At the same time, as urea is the most potent physiologic diuretic, a decrease in the amount of urine.

Interference with storage of glycogen

(2) Owing to the inability of the liver to convert sugar into glycogen and to store the latter, a flooding of the blood-stream with an excess of sugar that is derived from the ingested sugar or starches, with resulting hyperglycemia and glycosuria. This condition may be obscured if the patient does not happen to have eaten much starch or sweet foods, but it should readily appear even in mild degrees of hepatic insufficiency, as an alimentary glycosuria, if the patient is given appreciable quantities of starch or sugar in the food.

Decreased bile formation

(3) The inability of the liver to form bile leads to numerous serious consequences that have already been indicated above. Chief among these is stasis of bile within the biliary channels and as a result diapedesis of poisonous bile constituents from the bile-capillaries into the blood-capillaries, in other words, icterus. In this connection a very important subject should be mentioned, viz., that jaundice occurs only in relatively mild degrees of hepatic insufficiency, whereas in very severe degrees jaundice cannot possibly occur, for the reason that the liver cells no longer form bile. Here the intoxication is especially severe because the products that should normally be disintoxicated by the liver and excreted into the bile pass through the liver cells unchanged and are returned to the circulation in a highly toxic form. This condition has been called by the French *grande insuffisance hepatique.* Another result of failure of the liver cells to produce a normal amount and the normal kind of bile is interference with the function of the upper portion of the intestinal tract. The withdrawal of the bile or the entrance of abnormal bile into the bowel allows intestinal fermentation to go on unchecked, renders the normal emulsification of fats impossible, and produces numerous other results that have been enumerated above. At all events the withdrawal of normal bile from the bowel in itself

Cholemia

causes an increased flow of toxic bodies to pour into the liver through the portal vein and the intestinal lymphatics and hence promotes the causes that produce hepatic insufficiency. The derangement of the bile-forming function therefore produces a vicious circle that is highly dangerous.

In the urine this condition usually becomes manifest by an increase of the aromatic sulphates, notably indican, and the appearance of urobilin, bile pigments, and bile acids.

Metabolic derangements

(4) Failure of the liver to properly perform its share in the metabolism of the albumen and fats causes fragments of the latter to be returned to the circulation, either unchanged or disassimilated into abnormal products. This, too, produces a general intoxication and may, in its ultimate consequences, lead to a syndrome that is not distinguishable from uremia, and that is, moreover, in all probability uremia (see page 237). Here the urine contains abundant ammonia salts, relatively small quantities of urea and usually an abnormal amount of fatty acids, possibly of leucin and tyrosin.

Reduced disintoxicating power

(5) The loss or reduction of the normal disintoxicating power of the liver finally is the most serious result of hepatic insufficiency and usually constitutes a terminal stage of the affection. Here the portals are thrown wide open to the invasion of the body with poisons of a thousand kinds that are formed in the bowel and in the tissues at large. That the organism cannot long withstand this toxic flood is self-evident. In such cases the toxicity of the urine will be found to be enormously increased, while, at the same time, the kidneys invariably became affected, for upon them is now thrown the task of ridding the body of circulating poisons, a function that normally they share with the liver. When renal insufficiency complicates hepatic insufficiency a severe toxemia must develop in very short order, and again a fulminating syndrone is presented that closely simulates uremia.

Uremia

General indications for treatment

The treatment of hepatic insufficiency may be considered under two headings: (1) The suppression of its causes. (2) The symptomatic treatment of its manifestations.

Causal treatment

Causal treatment is in most instances synonymous with prophylaxis. Three factors, as I have mentioned above, chiefly determine insufficiency of the liver cells, i. e., infection, intoxication, mechanical causes.

The latter, unless we are dealing with some lesion that mechanically compresses the common duct and that can be removed surgically, is not amenable to treatment, so that in this instance we are limited to symptomatic therapy. There is an exception to this rule, that is, syphilis. Here we may be dealing with a

Antiluetic treatment in syphilitic hepatitis

gumma located in such a way that it produces compression of a large bile duct or of an important blood-vessel, or there may be a syphilitic interstitial hepatitis. In both of these instances anti-syphilitic treatment may remove the cause, mechanical though it be. To an extent this also applies to what may be called mechanical hepatic insufficiency due to venous stasis in the liver following heart lesions. Here cardio-tonic treatment may cause the symptoms of hepatic insufficiency to disappear.

Intestinal antisepsis

In the case of the intoxicating factors the source of poison is in the overwhelming majority of cases the gastro-intestinal tract. Here causal treatment should be carried out according to the following principles: To regulate the diet in such a way as to limit the ingestion of substances that are in themselves poisonous or that undergo changes in the bowel that lead to the formation of poisonous bodies; to reduce to the lowest possible minimum intestinal putrefaction; to prevent as far as possible the absorption of whatever poisonous bodies may have gained entrance to the bowel or may have been formed there; to promote the destruction of the latter in case they enter the circulation, and, above all, to hasten the rapid elimination of circulating toxins. The latter indication prevails with equal force in the case of poisons that are not formed within the bowel, but that are generated within the tissues of the body (endogenous poisons), as in infectious diseases and in a variety of metabolic disorders.

Stimulation of hepatic cells

Under the head of causal treatment all those measures might also be included that we know are capable of stimulating the hepatic cells to renewed activity when their energies begin to flag, but this treatment must be carried out with conservatism, as I will have occasion to show further on.

Symptomatic treatment

Symptomatic treatment includes the treatment of the protean array of sequelæ of hepatic insufficiency. As derangement of the liver function in its ultimate consequences may lead to the greatest variety of psychic, nervous, cardio-vascular, renal and metabolic disorders, symptomatic treatment of hepatic insufficiency, as stated above, in the broader sense covers a large field of therapy.

Dietetic treatment

Probably the most important dietetic rule in the treatment of hepatic insufficiency is a negative one, i. e., that all alcoholic beverages should be rigidly excluded from the diet. We do not realize sufficiently that pure alcohol is the least toxic of the alcohols that are used in the food of man; the higher alcohols and certain aldehydes and essential oils that are found in cheap liquors and that bestow the aroma or bouquet upon the various wines, liqueurs, and cordials, are much more poisonous even in the small quantities in which they are used; thus, e. g., absinthe contains some eleven different principles, all of which are poisonous. Alcohol itself, therefore, unless taken in enormous quantities, is not so terribly dangerous; but no one drinks pure dilute alcohol, but rather alcoholic beverages of various kinds, and as the latter are poisonous on account of the impurities they contain, it should be a cardinal rule in the treatment of hepatic insufficiency to exclude them rigidly from the diet.

Spices and condiments

On the same grounds spices and condiments should always be excluded because they contain essences and alkaloids that are toxic to the liver.

Reduction of fats

A second cardinal rule is to limit the ingestion of fats, for they are very poorly digested owing to the deficiency of bile acids from the bowel; it is clear that in this case, as stated above, they are not properly saponified and emulsified, undergo rapid decomposition in the bowel, and in this way lead to the formation of acid and acrid products that are highly irritating to the liver and the bowel. It has been shown that in cases of hepatic insufficiency the urinary toxicity increases greatly when much fat is given. While it is not necessary, therefore, to exclude the fats altogether from the diet, they should be reduced to a minimum.

Meat and eggs

Meat and eggs should also be reduced, for they furnish the bulk of the most toxic intestinal products whenever intestinal putrefaction goes on unchecked, and this we know to be the case when the bile is deficient or its composition is changed.

Carbohydrates

Vegetables

Milk

There remain, therefore, as chief articles of food, vegetables and carbohydrates; the latter, in particular, are not toxic nor do they lead to the formation of toxic bodies in the bowel; and besides, sugar, as we know, stimulates the liver functions to activity. Of course, care should always be exercised not to administer a diet containing too large a proportion of carbohydrate food, for otherwise fermentative dyspepsia, constipation, and a variety of digestive disorders may supervene. One should simply increase the amount of carbohydrate food to replace the deficit of fat. Milk can always be given with impunity. An exclusive milk diet, however, is for many reasons objectionable. (See page 208.)

General arrangement of the diet

To summarize, the patient should be placed upon a bland mixed diet, containing no alcoholic beverages, a minimum of fat, a small amount of albuminous food, and plenty of fresh fruits, vegetables, milk, cereals, starches, and, with care, sweets. That the details of this diet should be regulated in such a way as to consider the individual idiosyncrasies and tastes, and above all complications in other organs, notably the kidneys, need hardly be emphasized.

In view of the fact that the chief source of the poisons that intoxicate the liver and produce hepatic insufficiency is the intestinal tract, it is of paramount importance to attempt intestinal antisepsis (see index) in every case of hepatic insufficiency that comes under observation.

Evacuants

That the absorption of bowel poisons after they have once formed can be restricted by the use of evacuants is clear. A saline laxative given at frequent intervals, combined possibly with enemas to clean out the lower bowel, is a useful measure. Purgatives or drastics that can irritate the liver should be used cautiously.

Oxidizing treatment

Cold hydrotherapy

All attempts that have so far been made to promote the destruction of poisons after they have once been absorbed have been abortive. A. Robin, as is well known, introduced a so-called oxidizing treatment and advised the inhalation of oxygen, the use of iron and manganese preparations. I have never seen any tangible good results follow this treatment. Cold hydrotherapeutic measures, thanks to the leucocytosis, the increased metabolism, and the better circulation of lymph they produce, are of much use.

Diaphoresis and catharsis

The elimination of absorbed poisons by the various emunctories of the body is always indicated. Here elimination by catharsis (see above) and diaphoresis, preferably brought about by hydriatic measures, has a useful place. To attempt elimination by forced diuresis is, however, dangerous, as the toxins that are forced through the kidneys are bound to irritate them, and injury to the kidneys should of all things be avoided.

To restore function of hepatic cells

Rest

The last and most important task is to attempt to restore the function of the destroyed hepatic cells. Here the same principles must obtain as in the treatment of any organ that has become fatigued. In very mild cases slight stimulation may at once restore normal tone; in more chronic conditions, however, rest is the prime requisite, for when the affected organ is spared nature soon re-establishes functional equilibrium. We follow this plan exclusively in diseases of the stomach by withdrawing food for a while or by reducing the daily ration. We do it in diseases of the nervous system when we give a rest cure. We do it in diseases of the heart when we put the patient on a mild, nonirritating diet with an ice bag over the heart. We are beginning to apply the same plan in diseases of the kidneys, and it certainly has a grateful field of application in the case of the liver.

Exercise

Following a period of rest, what might be termed gentle exercise of the organ may be instituted either by throwing upon the liver tasks that it should normally be able to fulfill, or by gently stimulating it with remedies or physical measures that we know can produce this purpose. Active stimulation with powerful remedies should be reserved as an emergency measure in extreme cases, for nothing will so rapidly produce complete functional inadequacy of an organ that is functionally impaired as over-stimulation in the beginning.

Danger of active stimulation of the liver

Hydrotherapy

For the purpose of stimulating the function of the liver we can have recourse in the first place to certain hydrotherapeutic measures. It has been established by careful studies that general hot baths or the brief application of cold locally over the liver, preferably in the form of a stream of cold water directed for a minute or two against the hepatic region, will energetically stimulate the flow of bile. The same result can be obtained by the application of a so-called Priessnitz compress over the liver region. A towel is wrung out of cold water and laid over the liver and covered with a flannel.

Cholagogues

Many remedies are said to stimulate the formation of bile. Unfortunately, most so-called cholagogues do not possess this power at all, but simply irritate the stomach, the intestine, and the liver. Best of all are the salicylic preparations and the bile acids. (See page 488.) Preference should be given to the latter remedy because the salicylates are somewhat irritating to the kidneys. The stimulation of the glycogenic function of the liver can be brought about by an active alkali therapy. Antipyrin, too, possesses this power. Best of all, however, are the starchy and sweet foods, and these are already properly included in the diet.

Alkalies
Antipyrin

Urea

We know of no remedy that can stimulate the urea-forming function of the liver. The administration of abundant albuminous food constitutes a physiological stimulant to this function, and, if sufficient care is exercised that the bowel is kept aseptic, there is no reason why enough of albumen should not be given for this purpose, only however in mild stages of the disease. Some writers have advised the use of urea, itself, claiming that a certain amount of urea is necessary, especially in order to promote diuresis, and that where its formation is deficient it should be supplied. This plan does not appeal to me, and, despite the various favorable reports on this therapy I have never been able to convince myself of its value.

Organotherapy
Liver extracts

Liver extracts given in the form of powdered calf's liver or pork liver, suspended in milk or water, by enemata, or even subcutaneously, is worthy of trial. Symptomatically I have seen some good results from the ingestion of liver extract in cases of cirrhosis of the liver with hepatic insufficiency, especially in the direction of an increased urea excretion, an increased tolerance for carbohydrates, and an apparent improvement in some of the nervous manifestations. That the administration of liver extract stimulates the regeneration of liver cells, as is claimed by some clinicians (Gilbert and Carnot); that it produces a vicarious hypertrophy of those portions of the liver that are not affected is hard to prove.

Dangers of operative interference and chloroform

Finally, something may be said in regard to the danger of operative interference in cases of hepatic insufficiency. There is in most of these cases a tendency to hemorrhage due, possibly, to the circulation in excess of bile acids; for the latter have a distinct hemolytic power and interfere with the coagubility of the blood. Besides, the administration of chloroform is a very dangerous procedure in any case, even of mild hepatic insufficiency, for, in predisposed subjects who, we must assume, possess an idiosyncrasy against chloroform, a condition may develop which closely simulates acute yellow atrophy of the liver, both clinically and anatomically. I think it is just as important for this reason that surgeons should, as far as possible, examine the functional state of the liver before an operation as they do, or should, study the condition of the kidneys. If any of the evidences of hepatic insufficiency that have been enumerated above should be present, then chloroform at all events should not be administered as an anesthetic, and the possibility of profuse capillary hemorrhages be remembered. If it were not for this difficulty of operating upon cases of hepatic insufficiency the so-called Talma operation, which consists in producing an artificial collateral path for the flow of blood from the portal circulation into the systemic circulation, either by epipoplexy or by curetting the parietal peritoneum and the omentum, would be more useful than it really is.

Talma operation

Symptomatic treatment

Treatment of the dyspeptic symptoms, the ascites, the hemorrhages, the cardio-vascular changes, the nervous manifestations, the nephritic lesions, and the icterus that accompany or follow chronic inflammations of the liver need not be discussed again in this place, the different measures to be employed having been fully presented in appropriate sections.

CHOLELITHIASIS, CHOLANGITIS AND CHOLECYSTITIS.

Prophylactic treatment

In simple uncomplicated cholelithiasis, i. e., in a subject showing a tendency to recurrent attacks of gall stone colic, prophylactic treatment directed towards promoting an active flow of bile, and towards hindering catarrhal inflammation of the gall-ducts and the gall-bladder, can be instituted.

Stimulation of the bile flow

Every endeavor should be put forward to promote a steady flow of bile towards the intestine; for, in this way stasis of bile constituents is prevented. This is an important element in prophylaxis, inasmuch as stagnating bile forms a suitable nidus for the development of bacteria. Besides the invasion of the bile ducts and gall-bladder by bacteria from the intestine is rendered quite difficult if the bowel passages are constantly drained by an active stream of bile flowing towards the intestine.

Diet

Albumens

Carbohydrates

Fats

Alcohol

In order to stimulate the current of bile the diet should be mixed. It should contain an abundant quantity of albumen and relatively small quantities of carbohydrates and fats. Albumens more than starchy, sweet and fat foods lead to the formation of abundant bile acids and the latter render the bile more fluid, more abundant and also impart to it certain antiseptic properties. Carbohydrate foods, on account of their tendency to produce congestion of the liver and intestinal fermentation, when given in abundant quantities, should be somewhat reduced in quantity. Fats are apt to irritate the bowel and to produce intestinal dyspepsia, hence they should be very much reduced or altogether excluded from the diet, especially as their presence in the bowel would be particularly detrimental should an attack of gall stone colic with gall-duct occlusion suddenly supervene. Alcoholic beverages, spices, condiments and all irritating or coarse foods that can determine catarrhal conditions of the upper digestive tract should be avoided.

Small meals at frequent intervals

A steady flow of bile, moreover, is stimulated by the administration of meals at frequent intervals. Consequently in addition to the three regular main meals a day a patient with cholelithiasis should be instructed to take a glass of milk or an egg-nog with a few crackers, or a piece of toast, in the middle of the forenoon and the middle of the afternoon. The administration of a similar meal in the middle of the night is rarely necessary.

Abundant water drinking

Mineral waters

Plenty of water, especially some of the alkaline or alkaline-saline mineral waters, should be taken; the latter in particular aid in dissolving the mucus in the bile passages and hence in maintaining the bile ducts open. It is questionable whether alkaline waters exercise any determinable effect upon the alkalinity of the bile and hence, as some clinicians claim, aid in keeping the ingredients that precipitate in the form of concretions in solution. So much is certain that they exercise no solvent action upon gall stones after the latter have once formed. The cholagogue action of mineral waters is also in doubt and the dilution of the bile that is postulated from the administration of abundant liquids is problematical. Too great restriction of the intake, however, assuredly leads to greater viscidity of the bile, hence favors sluggishness of the bile stream and stagnation. The chief action of alkaline mineral waters is presumably exercised in preventing gastro-intestinal catarrh, hence abnormal fermentation, the development of bacteria and catarrhal swelling about the orifices of the gall-ducts. The laxative properties, finally, of certain mineral waters stimulate intestinal peristalsis and indirectly also peristalsis in the bile ducts; in this way, then, they also aid in the expulsion of the bile.

Resort treatment

The great benefits accruing from the use of certain mineral waters taken in resorts must be attributed only in part to the abundant ingestion of the liquid and the incorporation of the alkaline and saline principles they contain. The life in a resort, itself, the respite from the daily routine, the out-door existence, the careful regulation of the general regime and of the exercise, the scientific employment of hydrotherapeutic measures and the management of the case by skilled specialists are all elements that contribute towards the good results obtained from the resort treatment of cholelithiasis.

Exercise and massage

The regulation of exercise and abdominal massage are all useful adjuvants to the treatment, chiefly on account of their power to stimulate the flow of bile. Violent exercise should never be permitted to patients showing a tendency to gall stone colic; for sudden movements of the body are very apt to cause impaction of a gall stone and to precipitate an attack of colic. Violent exercise is altogether contra-indicated in cases of cholelithiasis complicated with cholecystitis and cholangitis, or in patients with chronic icterus due to impaction of a gall stone; for in these cases there is always danger of perforation and resulting peritonitis.

Clothing

The clothing should be loose and all pressure by the clothing on the liver region avoided. In women tight skirt bands and corsets should be forbidden and the clothing suspended from the shoulders. In men the wearing of belts is to be forbidden. It is usually a good plan to order these patients to loosen the clothing about the waist after meals.

Cholagogues

The use of cholagogues is indicated as a prophylactic measure in cases of cholelithiasis. As stated above in the Section on *Catarrhal Jaundice,* only two remedies can directly be credited with bile-stimulating properties, namely, the bile acids and the salicylates. In addition to their cholagogue powers, these two remedies also possess antiseptic properties that are especially useful in cholelithiasis; for both these remedies after absorption from the bowel are re-excreted in part *via* the gall-ducts, hence they promote an increased outpouring of bile that has been rendered, to some degree at least, antiseptic.

Sodium glycocholate

Salicylic acid

The best way to administer bile acids is in the form of sodium glycocholate in doses of one-half to two grains (0.03 to 0.13 gm.). Salicylic acid is better than the salicylates and a pill containing a grain each of sodium glycocholate and of salicylic acid, given three or four times a day, must be considered an efficient means to stimulate the flow of bile. All the other remedies that have been recommended at different times as cholagogues act presumably chiefly as laxatives. They may exercise some effect upon the flow of bile by increasing intestinal peristalsis and indirectly the peristalsis of the gall-ducts. They are vastly inferior, however, in efficacy to the two above-mentioned remedies (see also Section on *Catarrhal Jaundice*).

Expulsion of gall stones

All the measures enumerated not only aid in preventing the formation of gall stones, but also assist in the expulsion of gall stones that may be present in the bile ducts. In addition certain other remedies may be used for the latter purpose, namely, olive oil and glycerin.

Olive oil

Enteroliths after oil

The former is warmly recommended by some clinicians and condemned as utterly useless by others. Personally, I have never been convinced that the use of olive oil materially influences the course of a case of cholelithiasis, prevents the formation of gall stones, or aids in their expulsion. It is very questionable, in fact, whether the oil after absorption really enters the bile ducts and is re-excreted with the bile. Whatever good effects may occasionally be observed from the use of olive oil must be attributed in great part, at least, to its slightly nauseating and laxative properties whereby it stimulates peristalsis and contraction of the bile ducts. After the administration of olive oil small masses of saponified oleic acid are frequently deposited with the feces, and it is quite probable that these enteroliths have occasionally been taken for expelled gall stones.

Olive oil may either be given in one or two tablespoonful doses in the evening before retiring, or, better still, in fifteen drop doses before breakfast on an empty stomach, every day or every other day. A convenient formula for the administration of olive oil is the following, recommended by Rosenberg:

℞

Olive oil	200.0
Brandy	20.0
Menthol	0.2
The yolk of one egg	

This mass is thoroughly mixed and taken in two doses an hour apart. The disagreeable fatty taste of the oil can be removed by eating little pieces of orange or lemon peel, or taking a teaspoonful of orange or lemon syrup.

Glycerin

Glycerin, which is sometimes a very effective remedy in renal lithiasis (see page 231), is not so useful in cholelithiasis. It should be given in the dose of about half a teaspoonful in some mineral water once a day. Glycerin, too, probably acts on account of its laxative properties.

The solution of gall stones

The attempt to promote solution of gall stones in the biliary passages by the administration of any medicine by mouth must be considered altogether futile. Various drugs, like olive oil, ether, turpentine, chloroform, sodium oleate (eunatrol), and many others that are credited with this power are, I think, altogether inert in this direction.

Surgical removal of gall stones

If large masses of gall stones are present and if their removal becomes desirable (see below), then surgical means should be promptly adopted and no time wasted with medicinal measures.

Warning against promiscuous surgical treatment in gall stone disease

In view of the tendency nowadays to operate somewhat promiscuously in every case of gall stone disease, a certain warning may be uttered. There are distinct indications for surgical intervention which will be presently discussed. The appearance of gall stone symptoms, or even of signs of gall-bladder or bile channel infection, must not, however, be considered the signal for an operation in every case. A large proportion of patients suffering from chronic cholelithiasis recover without surgery, and it is well worth while in each case to give the patients the full benefit of medical treatment.

Limitations of surgery

Surgery at best can only remove gall stones or promote drainage of the gall ducts or gall bladder, but it cannot affect the morbid processes that originally led to the formation of gall stones or infection of the bile passages. The treatment of the case, moreover, is by no means completed after the gall stones have been removed, or the gall-bladder or the gall passages have been drained; and a patient once afflicted with gall stones, even after he has been operated upon, should remain under careful supervision until the hepatic disorder and the catarrhal condition of the bile passages are completely cured. This aim can only be accomplished by medical means, namely, by careful regulation of the patient's diet and general mode of life, by the administration of proper remedies and the institution of the other measures that have just been enumerated.

Indications for surgical intervention

Under the following conditions surgical intervention, however, becomes necessary and constitutes the only effective means of treating these cases, namely:

First. In frequently recurring attacks of gall stone colic that do not yield to internal treatment, that reduce the patient's health and impair his working capacity, especially if the presence of many gall stones in the gall bladder can be determined.

While one can never predict that an attack of gall stone colic may not be the last one, it is, nevertheless, important to remember that each attack injures the bile passages and may lead to ulceration or the formation of dangerous strictures or adhesions or stenosis (or acute, hemorrhagic pancreatitis). Repeated attacks, therefore, in which any evidence of such complications appears, must be considered fit for surgical intervention.

Recurrent attacks of colic

Suppurative cholangitis and cholecystitis

Second. If suppurative cholangitis or cholecystitis complicates the disease. Here spontaneous recovery may occur (see below), but free drainage and irrigation and removal of the gall stones that keep up the irritation of the gall-bladder and bile passages, is usually the quickest and most certain means of producing a cure.

Complete gall duct occlusion

Third. In complete common duct occlusion which persists and leads to the development of profound icterus. This condition should never be allowed to persist for longer than two months at most. If, during this time, serious impairment of the patient's health occurs, an operation should be performed much sooner. It is usually dangerous to wait too long in this condition, because in chronic icterus of this kind a tendency to hemorrhage develops which may render an operation especially dangerous.

Peritonitic signs

Fourth. Peritonitic symptoms developing as the result of perforation or rupture of the gall-bladder or its ducts, occurring either during an attack of gall stone colic or developing slowly in the course of chronic stenosis or ulceration of the gall-bladder or the bile duct.

Adhesions

Fifth. Adhesions forming around the gall-bladder and producing mechanical dislocation or stenosis of adjacent organs, especially the stomach, the duodenum and the colon, and causing a variety of distressing symptoms, chiefly pain, gastro-intestinal disorders, and biliary colic. While it is true that adhesions are apt to form again even after an operation, a skillful operator can usually manage the field of operation in such a way that the new adhesions form in a more favorable locality.

TREATMENT OF THE ACUTE ATTACK.

Treatment of the acute attack

In treating an acute attack of gall stone colic the following indications must be met:—

First, to stop the excruciating pain.

Second, to facilitate the passage of the stone and prevent its permanent impaction.

Opiates

Both of these indications are best met by opiates; for the latter not only promptly stop the pain, but also cause the relaxation of the muscularis lining the gall-ducts and hence facilitate the passage of the stone. One must imagine that spastic reflex contractions of certain portions of the bile duct are stimulated by the stone and that, in this way, the concretion is held tightly in one place. If opium or morphine are given, this tonic contraction stops and new peristaltic movements are gradually resumed until the stone is either expelled or is again arrested by spastic contractions of some part of the bile passages farther down; as soon as this occurs an opiate should again be administered.

Dose and administration

The best way to administer opiates is, therefore, to give a hypodermic injection of a quarter of a grain (0.005 gm.) of morphine as soon as the patient is seen and to repeat the dose once or twice according to the requirements of the case; or a hypodermic of morphine may be given at first and later, when attacks of colic return, ten to twenty drops of the tincture of opium by mouth, to be repeated at intervals of one or two hours.

Belladonna and atropine

Belladonna and atropine also relieve the muscle spasm and can be used instead of, or together with, opium or morphine. Belladonna is best given either as the extract of the leaves in powder form in the dose of ¼ to ½ grain (0.015 to 0.03 gm.); or in the dose of five to fifteen minims (0.3 to 1 cc.) of the tincture of belladonna leaves repeated several times; or as atropine sulphate, in the dose of one-hundredth to one two-hundredth of a grain (½ to 1 mg.), either alone or in combination with a quarter of a grain (0.015 gm.) of morphine.

Antipyrin and other analgesics

Sodium salicylate

Other remedies employed for the purpose of stopping the pain in cholelithiasis are antipyrin and other members of the group of coal tar analgesics, sodium salicylate and many more. No remedy, however, is as efficacious as opium or belladonna. If the pain is very severe and does not yield promptly to the administration of morphine, then a few drops of chloroform on ice, or a teaspoonful of chloroform water, repeated at frequent intervals, or even a few whiffs of chloroform, may have to be given. Chloral is not as valuable as chloroform and is, in most cases, a dangerous remedy to be employed.

Chloroform

Chloral

Hot and cold applications

Heat or cold may be applied locally. Heat is usually much more effective in alleviating the pain, especially when applied continuously by means of hot poultices, a Leiter coil charged with hot water or a thermophore (see index). Immersion of

Hot bath

the patient in a hot bath is also a very effective means, in most cases, of cutting the attack short.

Cold applications

If heat is not well borne, and this is most apt to be the case, especially in the presence of complicating cholecystitis and cholangitis, cold may be used instead. As pressure upon the gall-bladder region is rarely well tolerated, it is best to suspend the ice bag over the patient and to have it barely in contact with the gall-bladder region, or to use a Leiter coil charged with ice cold water applied to the same place.

Laxatives

Enemata

Free evacuation of the bowels by the use of laxatives and enemata should always be promoted when an attack of gall stone colic occurs. If castor oil or sodium phosphate are vomited, then high rectal injections of cool water may be administered both for the purpose of cleaning out the lower bowel and for the purpose of stimulating intestinal peristalsis (see the Section on *Catarrhal Icterus,* page 487). Enemata of olive oil are also useful.

Collapse

Analeptics

Alcoholic drinks

If very reduced and weak patients should develop symptoms of collapse or shock from the severe pain, analeptics (see page 32) may have to be administered, especially if the pain is not promptly controlled by the use of morphine. A little champagne, hot alcoholic drinks, camphor, ether, ammonia, or adrenalin chloride administered by mouth or hypodermically are all of use.

CHOLANGITIS AND CHOLECYSTITIS.

Cholangitis and cholecystitis

In infections of the bile ducts and gall-bladder (cholangitis and cholecystitis), an attempt should always be made to control the infection by medical means; for this purpose hot or cold applications to the gall-bladder region should be made and continued for several days. The choice of heat or cold will have to be made according to the subjective sensations of the patients.

Cholagogue-antiseptic treatment

The bowels should be thoroughly cleaned out and kept clean by the administration of laxatives and enemata. Here a cholagogue-antiseptic treatment with the salicylic acid and bile acid combination described above, to which may be added half a grain of menthol as an antiseptic and anesthetic, is useful. The following combination is also very popular for continued use:

℞

Sodium benzoate	0.5
Sodium salicylate	1.0

In pill or capsule, to be given three or four times a day. (Chauffard.)

I consider the salicylic acid and bile acid pill, however, to be more efficacious.

Diet

The diet during this treatment should be bland and non-irritating. During the first week of the bile passage infection, milk alone is best given, during the second week soups or thin gruels may be added to the milk, and during the third week and later a little meat and a gradual resumption of a general mixed diet may be allowed.

Surgical treatment

If all these measures fail within a few months to relieve the inflammation, or sooner if the patient suffers from recurrent attacks of pain with or without icterus, and develops signs of general septic toxemia, loses much strength, becomes emaciated and anemic, recourse must be had to surgery. Opening of the gall-bladder, free drainage and irrigation usually produce prompt relief and, in most cases, constitute the only means of effecting a permanent cure of this obstinate and dangerous condition

CHAPTER X.

INFECTIOUS DISEASES

INTRODUCTORY.

General indications for treatment

Acute infectious diseases are in a sense self-limiting and display a tendency towards spontaneous recovery. The chief duty of the physician, therefore, must be to imitate the methods put forward by Nature towards restoring normal conditions, wherever that is possible. Wherever, in the obscurity of our present knowledge, that is impossible, he should concern himself with creating ideal conditions about the patient in order to enable him to exercise his best efforts towards combating the infection. Here and there, besides, it may become necessary to strengthen, reinforce and stimulate reactive processes when they begin to flag; to hold them in check when they threaten to exceed safe bounds. Finally, various disorders about the different organs and functions of the body produced by the infection call for regulation and symptomatic treatment.

Specific antiseptic prophylactic treatment

Expectant-symptomatic treatment

The specific (diphtheria), or antiseptic (syphilis, malaria, rheumatic fever), and specific prophylactic (small pox, tetanus, hydrophobia, tuberculosis [?]) treatment of the disease is possible only in a few infections. In all the others we are limited in our endeavors and can only treat the patient by an expectant-symptomatic plan.

Provided the broad principles of hygiene and of the general management of the patient afflicted with an acute infectious disease are understood and carefully applied, the basal treatment of most infectious diseases, for which we possess no specific remedy, is very much alike. In order to avoid unnecessary repetition a few general remarks in regard to the rationale of fever treatment, and in regard to the principles that should underly the arrangement of the fever diet may be discussed in this place.

THE TREATMENT OF FEVER.

Treatment of fever

Fever a salutary reaction

The treatment of the fever is an important element in all acute infectious diseases. It is essential to realize that the fever, provided it is not too high nor too persistent, does not seriously damage the organism. In fact, the febrile reaction must be considered one of Nature's most effective means of combating the infection. Interference on the part of the physician is required, therefore, only if the febrile reaction exceeds safe bounds. The old idea that the fever must at all costs be kept down was based on the erroneous idea that the parenchymatous changes seen in many organs during the course of acute infectious diseases were produced by the high temperature. Nowadays, we have learned to recognize that these lesions are caused by the action of circulating bacterial toxins.

The normal automatic fever mechanism

Upon the onset of an infectious fever the high temperature is produced not only by an increased manufacture of heat but also by a decreased radiation of heat. The loss of heat is inhibited chiefly by contraction of the cutaneous vessels, so that early in most infectious diseases the skin becomes cool and the patient suffers a chill. Sometimes this reaction presumably suffices to abort the infection. If this preliminary condition were to continue throughout the course of the disease the patient's temperature would rise to unsafe limits; consequently, the radiation of heat is automatically resumed very soon after the initial chill chiefly by two paths, namely, by the pulmonary and the cutaneous route. This adjustment must be considered as a self-regulating mechanism. Inasmuch as the increased production of CO_2 which accompanies the initial febrile rise stimulates the respiration, more rapid breathing occurs, more water is exhaled and considerable heat is lost in this way (each gramme of water evaporated in the expired air causing a loss of about 575 calories). The loss of heat through the skin is promoted by sweating and the evaporation of surface water. (Sweating during the crisis serves a different purpose; it must be considered as an endeavor on the part of the organism to rapidly get rid of the surplus water which was retained in the blood and tissue juices during the fever in order to maintain proper osmotic equivalents).

The initial chill

Radiation of heat via the pulmonary and the cutaneous route

Fresh, cool air and hydrotherapy

In cases suffering from excessively high degrees of fever these methods that Nature spontaneously puts forward must be imitated. The pulmonary radiation of heat must be encouraged by supplying plenty of cool, fresh air (see Section on *Pneumonia*). The cutaneous radiation must be aided chiefly by hydriatic means (see Section on *Typhoid*).

Antipyretics

In addition certain remedies can be employed for their antipyretic effect. Here what may be called "central" as against "peripheral" regulation of the temperature is attempted, inasmuch as most antipyretic drugs act on the central nervous elements and paralyze the heat centers. In the latter case, therefore, the manufacture of heat is reduced, whereas by the former method the radiation of heat is increased.

In nearly all cases of acute infectious diseases one can get

General indications and contra-indications for the use of antipyretic drugs

along very well without antipyretic drugs, and they should be given very sparingly and with great care only in extreme cases in which high degrees of temperature cannot be reduced by the pulmonary or the cutaneous route. Antipyretics should, moreover, only be given intermittently and always in combination with heart tonics. Their use is rarely called for early in the disease and they are useful chiefly when the tone of the heart and of the vaso-motor centers has begun to flag, when the self-controlling mechanism fails and calls for regulation by artificial means. It will generally be found that antipyretics exercise a much more profound and rapid effect precisely during these later atonic stages than during early sthenic periods of the infection.

The chief antipyretics

To enumerate all the antipyretic drugs that can be employed (and to this class, broadly speaking, belong remedies that act directly on the fever-producing toxins like quinine and salicylates, drugs that paralyze the muscles (curare), drugs that paralyze the peripheral capillaries and hence promote increased radiation) is unnecessary. The chief antipyretics to be employed are quinine, salicylic acid, antipyrin and its congeners, and alcohol. The dose and administration of these drugs and of certain other antipyretics will be discussed below in their appropriate places.

Quinine
Salicylic acid
Antipyrin and its congeners
Alcohol

THE FEVER DIET.

The most important element in the feeding of febrile cases is to maintain the albumen content of the organism. The amount of albumen consumed by a fever patient and the degree of general emaciation that supervenes depend somewhat on the character of the poison and the complications that arise. To maintain complete nitrogen equilibrium is usually a very difficult task. The attempt, however, should always be made to introduce small quantities of albumen daily in some form, together with plenty of carbohydrate and some fat. Both fats and carbohydrates protect the albumens of the body; the latter much more than the former, however, inasmuch as 100 fat calories can replace only 5.4 albumen calories, while a hundred carbohydrate calories can replace 15.4 albumen calories.

Caloric requirements of febrile organism

The demand for food is decreased in febrile cases and its assimilation interfered with; at the same time the individual is quiescent and performing no labor, so that the total caloric requirement, despite the increased metabolism, is lower than one might expect and can consequently be supplied much more readily than if the individual required a normal amount of caloric values to maintain nutrition. In a subject weighing about seventy kilos the following ration theoretically calculated is usually sufficient:

50 gm. of proteid	= 205 calories
50 gm. of fat	= 495 calories
500 gm. of carbohydrate	=2050 calories
	2720 calories

or about 30 calories per kilo.*.

Eggs
Milk
Sugar solutions
Gruels
Gelatinous foods
Fats
Alcohol.

In practice the following general rules of feeding sufficiently approximate the above requirements. Albumen should be supplied in the form of one or two eggs in some shape daily, or in the form of milk; the latter being the most valuable fever food of all, inasmuch as 1000 cc. of milk incorporate 35 grammes of proteid, 35 grammes of fat and 45 grammes of sugar, representing total caloric value of 650 calories. The addition of abundant carbohydrate to milk, in the form of sugar solutions or gruels made of milk and flour, barley, arrowroot, sago and tapioca, usually suffices to bring the daily ration up to the required caloric value. Proteids may also be supplied in the form of gelatins, meat jellies, etc., and other liquid and semi-liquid meat products, the preparation of which is described in the Section on *Typhoid Fever*. The fats should be given in small quantities and supplied only in the form of cream, or as a little butter added to gruels, or in the small quantities of meat fat that remain in the meat preparations that can be administered. Alcohol in small quantities, aside from its antipyretic properties, constitutes a useful food in fever cases, especially as it possesses very marked albumen sparing properties.

Water

Water should always be given in abundant quantities in fever cases, not only in order to quench the thirst and to dilute the toxins, but to relieve the organism of the necessity of manufacturing water from its own tissues, thereby splitting up complex molecules and flooding the blood and tissue juices with waste products. A febrile patient should be offered a drink every fifteen to thirty minutes during the day, alternating the beverage, i. e., offering milk, soups, lemonade, a little wine, coffee, tea and water.

The following fever diet, which is employed as a routine in the Charité Hospital in Berlin, may serve as a prototype of an average fever diet:—

For breakfast 500 cc. of milk sweetened with plenty of sugar and flavored with a little coffee.

For dinner 250 cc. of meat broth.

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*See also chapter on *Diseases of Metabolism*.

In the middle of the afternoon 500 cc. of milk, with sugar and coffee as above.

For supper 250 cc. of gruel made of milk and flour.

Distributed over these four meals 80 grammes of rolls, toast or zwieback.

The following dietary constitutes a daily ration which about meets all requirements:

1000 cc. of milk	= 650 calories
2 eggs	= 150 calories
400 cc. barley gruel	= 200 calories
100 g. zwieback or toast	= 350 calories
100 g. cane or milk sugar	= 410 calories
200 cc. of Tokay or port wine	= 300 calories
Total	=2070 calories

State of the digestive function

In arranging a dietary, finally, the state of the digestive function must be carefully included in the calculation. Both the fever and the toxemia affect the digestive organs in the sense that the amount of saliva and its amylolytic power are reduced, that the motor and secretory powers of the stomach and bowel are impaired and the flood of bile is decreased.

Rectal feeding

These perversions of the digestive function are reflected in the loss of appetite. In cases of fever in which there is a complete distaste or aversion for food, rectal feeding (see index) may therefore have to be resorted to.

Toilet of the mouth

An important element, finally, in maintaining the proper nutrition of fever patients is to perform a careful toilet of the mouth, as described in the Section on *Stomatitis.*

In the following pages those infectious diseases that are amenable to specific treatment have been discussed in full, whereas of the large group of infections that must be treated by the expectant-symptomatic plan, only the most important and the most common members have been specially noted. In order to avoid useless repetition in this volume the treatment of the complications occurring in different organs has only been touched upon, for full symptomatic treatment of the different organ lesions has been already described in the preceding chapters.

PNEUMONIA.

(By Dr. E. F. Wells, Chicago.)

Significance

Pneumonia is a widely prevalent and very dangerous disease; in temperate regions it is responsible for more deaths than any other malady; its prevalence and dangers, measured by any rule which you may choose to apply, are increasing with each passing year; its treatment is the greatest and most pressing medical problem of the day. What can we do to lessen its prevalence and reduce its mortality? These are the questions, shorn of all minor and collateral issues, which are presented for our careful consideration.

teries
rbi

Pneumonia is caused by the pneumococcus. This bacterium, in one or another of its varieties, you may find in the upper respiratory passages in a large proportion—probably one-half—of all healthy persons. It is disseminated through the air which has become pneumococcus-laden by the spray produced in coughing and sneezing, and from dried and pulverized sputum of infected, but not necessarily pneumonic, individuals. If such air is inhaled by a healthy person the germs may find permanent lodgment in his nose and throat. In this locality the pneumococcus is probably an innocent parasite, but if it finds its way into the pulmonary alveoli pneumonia results. The entrance of this organism into the air cells may be invited by any condition which renders paretic the laryngeal and bronchial reflexes. It is found in the circulating blood, early—I have recovered it within an hour of the initial chill—in a very large proportion, if not all, of the cases. Intercurrent or independent pneumococcal inflammation, with sanguineous infection of other organs and tissues, as, e. g., endocardium, articulations, peritoneum, etc., may occasionally occur. The various strains of the pneumococcus vary in virulency, and those which are most virile obtain the widest distribution and create the greatest havoc.

phylaxis

With the basic etiological facts fully appreciated we are prepared for an intelligent consideration of the prophylaxis of this malady. This I believe to be the most important and most hopeful section of the whole pneumonia question, which is commended to the earnest attention of the profession.

In the case of each individual under professional care the tonsillar surface secretions should be examined for the pneumococcus. If a Gram positive encapsulated diplococcus (or streptococcus) is obtained it may be considered, *for this purpose only*, sufficient evidence of the presence of the pneumococcus Such examinations should be repeated at intervals, in order to have fair knowledge whether the patient is, or is not, affected. Keep a record of, and report to him, your findings. With the throat free from pneumococci the individual is practically exempt from pneumonia.

For the medical practitioner I recommend the following

Technique of determination of micro-organism

technique: Rub a sterile cotton swab over both tonsils; make cover-glass spreads; dry, and fix with heat. Have prepared the following solutions:

A.—*Gentian violet solution*:

Saturated alcohol solution gentian violet,	6 cc.
Alcohol,	10 cc.
Glycerine,	10 cc.
Carbolic acid solution, 95%,	4 cc.
Water, distilled,	60 cc.

B.—*Iodine solution*:

Iodine,	1 gm.
Iodide of potassium,	2 gm.
Water, distilled,	200 cc.

C.—*Fuchsin solution*:

Saturated alcoholic solution fuchsin,	0.5 cc.
Alcohol,	10.0 cc.
Glycerine,	10.0 cc.
Carbolic acid solution, 95%,	4.0 cc.
Water, distilled,	60.0 cc.

Stain the specimen with the gentian violet solution for one minute; wash well in water; apply the iodine solution for two or three minutes; wash; decolorize thoroughly with alcohol; wash; counter-stain with the fuchsin solution, heated, for one minute; wash thoroughly; dry; mount; examine with one-twefth oil immersion lense. Pneumococci stain intensely violet or blue, almost black at times; the capsules remain uncolored, contrasting sharply with the deep stain of the organisms and the rosy or brilliant red of the general field. When pneumococci lie upon or beneath an epithelial cell the capsule may present a pink or rosy hue, due to the staining of the cellular protoplasm. Sometimes the pneumococci are in chain formation, with either a continuous sheath-like capsule, or with the ends of the diplococcal capsules joining end to end. The streptococcus mucosus (capsulatus) takes this (Gram) stain, is found alone in some cases of pneumonia, ferments inulin, coagulates inulin-water-serum and should be classed as a variety of the pneumococcus. All streptococci retain the stain well; staphylococci and diphtheria bacilli stain in lighter shades; tubercle bacilli stain a deep or brilliant red; Friedlander's bacillus and the influenza bacillus are stained pink or rosy red.

The capsule of the pneumococcus may be stained with Wright's or other methylene-blue-azure stain, or by Welch's or His's stain. Differentiation may be more closely made by various cultural, fermentation, agglutination and animal inoculation tests, a consideration of which is beyond the scope of this treatise. For further information reference is made to the current literature.

If pneumococci are not found in the throat every reasonable precaution should be taken to prevent future infection. The mouth, nose and throat should be kept as clean as possible. Unclean fingers, money and other articles which are promiscuously handled, should be kept out of the mouth. Antiseptic nasal sprays, mouth-washes and gargles may be used. The teeth and mouth generally should be frequently and carefully cleansed; water should be swallowed after eating; mouth-breathing should be avoided. The nasal passages should be kept as free as practicable from accumulations of mucus; if there are organic obstructions they should be removed. Hypertrophied and honeycombed tonsils should be ablated or otherwise properly treated. Extraordinary efforts should be made to avoid crowds of coughing and sneezing persons, and to keep well beyond the range of possibly pneumococcus-laden air. Residence in regions where the pneumococcus is rare may be considered. The obvious intent in instituting all these measures is, as must be evident, to avoid or minimize the risks of invasion, or prevent lodgment of the pneumococcus in the upper respiratory passages.

If the pneumococcus once finds infective lodgment in this region it remains, so far as I know, a permanent resident, impossible of dislodgement by any known means. The individual is now liable to pneumonia at any time, although he may pass through life without an attack. Under these circumstances, notwithstanding our best efforts, pneumonia cannot always be prevented; it may, however, be invited, and such invitation should not be intentionally extended.

Communal protection

In the case of the infected person the measures above recommended for the uninfected should be followed, with the hope that the virulency of the organism may be reduced, and that the infection may be least likely to extend to others. He should, in addition, avoid the excessive, and even the so-called moderate, use of alcohol, or any other drug which will render paretic the reflex nerves which stand sentinels at the portals of, and along the course of, the deeper respiratory tracts. For the same reason undue exposure to cold and inclement weather; privation; physical and mental exhaustion; profound sleep when chilled or over-tired; all should be avoided. The chances of contracting diseases, as, e. g., typhoid fever, measles, smallpox, etc., which may lay the foundation for pneumonia, should be minimized; should they develop special attention should be given to the preservation of the respiratory reflexes. Anesthetics should be employed with caution, and only after careful preparatory cleansing of the nose, mouth and throat.

Impressively advise those who harbor the pneumococcus to carefully avoid disseminating the infective organism, and patiently instruct them how this may be done. Such persons should, in coughing, sneezing and blowing the nose hold a moistened cloth before the mouth and nostrils in such manner as to prevent the projection into the surrounding air of the fine, probably pneumococci-bearing spray which ordinarily follows these explosions. In pneumonia the sputum which clings so persistently to the teeth and lips, and that which may adhere to the fingers and bedding, should be wiped up with moistened gauze or other cloth and these burned. That which is freely expectorated should be caught in a vessel which may be boiled, thus destroying the germs and cleansing the receptacle. In some efficient manner all sputum should be destroyed. A room which has been occupied by a pneumonic patient should be disinfected.

For additional communal protection there should be displayed in all public places placards bearing the legend:

> "WHEN COUGHING OR SNEEZING HOLD HANDKERCHIEF BEFORE YOUR MOUTH AND NOSE."

In addition, the advice given in the preceding paragraph, formulated into plainly stated and available rules, should be widely and persistently circulated among the laity by the responsible health officers. A supply of these rules, neatly printed, but without imprint, should be furnished practising physicians, with the request that they give them as their instructions to their patients and clientele.

Finally, not only maintain your own enthusiasm in this matter, but by every means within your power arouse and foster the interests of other physicians and humanitarians in this subject. For example, take the initiative in organizing special committees and societies for the purpose of stimulating the study of the problem and reinforcing the efforts of the various health bodies, as has been so successfully done in the case of tuberculosis.

At this point it behooves the conscientious physician who may be called upon to treat cases of pneumonia to take stock of himself in order that he may decide whether he should, in all fairness, assume such a grave responsibility. If he possesses the necessary knowledge; if he has observed and managed a number of cases of this disease; if he has sufficient physical endurance; if he is free from impairing drug habits; if he has at all times a good and unclouded judgment; if he has executive ability; if, in addition, he possesses self-confidence he may safely undertake the management of cases of this serious malady. On the contrary if, because of lack of opportunity, inherent incapacity, or acquired habits, he finds himself lacking in the above essentials he should decline to treat these cases.

With the failure of preventive measures and the development of pneumonia, how shall the patient be managed that his every interest may be best conserved?

Initial care

Assuming that your patient is a middle-aged adult, of previous good health; with no drug habits; in easy pecuniary circumstances; that the environment is ideal; that you see him at the beginning of the attack; that the diagnosis is made; under these conditions much is required and much is to be done at the first visit.

First medication

At the beginning of the attack the patient should be placed in bed, surrounded by bottles of hot water, and given, hypodermically, one-twelfth or one-eighth grain of morphia, for the purpose of relieving the pain, allaying nervous excitement and restoring circulatory equilibrium. He should lie quietly until the chill has subsided, when the hot water bottles should be removed and the perspiration wiped from the surface of the body. The bowels should now be evacuated by an enema of two ounces of Epsom salts, two ounces of glycerine and twelve ounces of water; later an efficient cathartic should be given.

The sick room

The sick-room should be large, well ventilated and with south, east and west exposures. It should be comfortably furnished, including two narrow beds of suitable height. Bathroom and other modern conveniences should be adjacent. There should be provision for regulating the temperature, that the air may be comfortably warmed in winter and cooled in summer.

Nurse

A nurse and an assistant will be required. The nurse should have inherent ability, diligence, acute observation, good judgment, abundance of reserve capacity, excellent training and reasonable experience. Her assistant should be thoroughly competent. She should be given written directions, which may be, approximately, as follows:

DIRECTIONS FOR THE NURSE.

1.—Follow the ordinary rules of good nursing, including, particularly, keeping awake, alert, attentive and closely observant at all times; keeping of full and accurate records; the prompt report of striking, unexpected or important changes as they occur.

2.—Keep the room at an equable temperature, 65° to 70° F., as may be agreeable to the patient. The humidity should be moderate. The air should be fresh and pure. There are no objections to agreeable odors.

3.—Promiscuous visiting should be prohibited; no one should be admitted to the sick room except those specifically designated by the physician. The consideration of business problems is highly objectionable. Quietude of mind and body should be favored by maintaining a general air of hopefulness.

4.—The patient should be confined to his bed; his position should be changed often, but in such manner as to cause the least discomfort; he should be generally handled with gentleness, in bathing, in the use of the bed-pan, in changing his clothing, etc. The narrow bed should be so placed as to permit approach from either side; one bed should be used during the day, the other at night; in moving the patient from one to the other bed, place the beds side by side and slide him across with the sheet, two persons being necessary. The mattress should be elastic, the pillows soft, the sheets of thin woolen goods, and the covers light. The night-dress should be of thin woolen, or silken, goods, and so arranged as to afford easy access to all parts of the chest.

5.—The surface of the body should be bathed twice daily with warm water, to which a little Cologne water has been added. If there is a tendency to chilliness the bathing should be done under the covers. The face and hands may be bathed as often as required. If there should be much perspiration the surface should be wiped dry, gently rubbed with a cloth dampened with alcohol and a drying powder applied. The ice cap should be used if the temperature runs high, or if the head aches, provided it is not disagreeable. The hot water bottle, or the electrotherm, should be used if the extremities become cold; if agreeable they may be applied to the painful side.

6.—The patient should be encouraged to restrain ineffectual coughing as much as possible. The expectoration should be caught upon moistened gauze and preserved for the physician's inspection; that which clings to the lips, or falls upon the floor or clothing, should be wiped up; all sputum should be destroyed before it has become dried. The mouth should be kept clean. All utensils, and other articles which come in contact with the mouth or sputum, shoud be scrupulously cleansed and disinfected. Later the room should be disinfected.

7.—Nourishment should be given as follows:—Four times a day, at six hourly intervals, the patient should be given one egg, a piece of toast and a glass of milk. The egg may be given in any form desired. The milk may be cold or hot, with or without lime water or Vichy, peptonized, fermented or soured, or in the form of milk soups, cocoa, *caffe au lait*, etc., as required to meet the tastes or digestive needs of the patient. Three hours after each of these feedings there should be given a half-pint of well seasoned and agreeably flavored beef, mutton or chicken broth. At other times there should be given water, carbonated waters, fruit juices, tea, coffee, etc., to such an extent that the patient receives a total of about eighty ounces of liquids, of all kinds, in the twenty-four hours. The salt used should have added to it 1 per cent. of sulphate of lime, and it should be used as freely as it can be borne. If solid foods are objected to the toast may be omitted. If nausea or vomiting preclude gastric nourishment enemas, to be retained, of eight to sixteen ounces of coffee, with forty to eighty grains of table salt, and three to six grains of chloride of calcium, should be administered every four to six hours.

8.—The first night give two five grain pills of blue mass, followed next morning by a half bottle solution of citrate of magnesia. Later the bowels should be made to move twice daily by enemas; that in the morning should be a large normal salt flushing one; that in the evening should be the stimulating one of sulphate of magnesia and glycerine above mentioned. The latter enema should be used at any time if there should be intestinal paresis with abdominal distention. The mixed twenty-four hours' urine should be preserved and a two ounce specimen, and one ounce of recently passed urine, furnished the physician daily for analysis.

NOTES.

a.—The patient should be given every needed and ordered attention, but excessive and fussy attention should be avoided; he should be allowed sufficient rest when awake, and should not be awakened from sleep. There should be no rustling of skirts, rattling of utensils nor clattering noises allowed. In his presence the patient should have the undivided attention of nurse and physician; for the time he is the center of the world.

b.—The nurse should be especially instructed as to the significance of certain symptoms and conditions, and as to the initial management of some of the most serious complications:—In some cases of observant delirium the patient should be very closely watched, in order that he may not elude vigilance and escape. In the slight but gradually increasing duskiness of the surface, and blueness of the nails, of early cyanosis, oxygen should be promptly administered. In the spreading ashiness of the surface, with changed character of the cough and serous expectoration of pulmonary edema, the foot of the bed should be raised sufficiently high to make the mouth and nostrils the lowest portion of a draining inclined plane, and a hypodermic injection of one-twelfth grain of morphia, one one-hundred and fiftieth grain of atropia and one-thirtieth grain of strychnia should be immediately given. In the late surface glow, with increasing frequency of the pulse and slight capillary and venous pulse, which is the beginning of a dangerous vaso-motor paresis, there should be administered, under the skin or deeply in the muscles, one or more syringefuls of a five per cent. solution of camphor in sterilized olive oil. It is needless to say that proper provision should be made for all these, and other contingencies.

c.—The nurse should be informed that late sneezing is of good augury; that the slight respiratory click, which does not attract the attention of observers generally, and which promptly returns after being silenced by a cough, is of ominous import.

At this place it may be well to make some preliminary statements which will clear the way for more rapid progress:—

Morbid processes

Have we an efficient specific treatment of pneumonia? It is well known that the pneumococcus, in the blood, and in the hepatized lung, produces certain substances which are as yet known only by their effects, as e. g., the initial chill and nervous shock, the prompt occurrence of capillary dilatation and leucocytosis, later the appearance in the intra- and extra-vascular serum of a specific agglutinin, and yet later the production of a toxin which speedily causes the pneumococcus to disappear from the blood. These facts have led to reasonable expectations that there might be prepared an anti-pneumococcic serum which, when introduced into the circulating intra- and extra-vascular serum of the pneumonic patient, would speedily, and certainly, cure the disease. In my opinion, such sera, reliably efficient, have not yet been produced. It is noticeable that, with a profession eagerly awaiting the advent of such sera, those thus far placed upon the market have signally failed to meet that favor at the hands of clinicians which is quickly and enthusiastically awarded therapeutic novelties of real value. However, analogy leads us to believe that a useful antipneumococcic serum may be produced, and I remain hopeful that this will be early accomplished.

The pneumonic crisis corresponds so closely in point of time to the extinction of the infecting organism that we are forced to the conclusion that it is the death of the pneumococci, and not the neutralization of their toxins, which is the event which must precede recovery of the patient, and experiments only strengthen this conviction. A pneumonia antitoxin is, therefore, not to be expected, and none has been produced which has attracted any favorable therapeutic consideration.

Abortive cases

The abortion of pneumonia has always attracted much attention. In the ephemeral cases, with recovery in one, two or three days, there is probably infection by a very weak strain of the pneumococcus, which is early and readily destructively affected by the developed toxins. Possibly there is erected a protective barrier, which is efficient against so virile an organism, by the leucocytes, those active motile glands which swarm into the circulation as defenders of our bodies when its integrity is threatened by the invading foe. If such cases have been submitted to treatment we should hesitate before attributing the happy result to the therapeutic measures which may have been employed.

Returning now to the patient, seize the first opportunity to obtain specimens of the blood and urine, for examination.

The blood should be examined daily, or oftener, including an enumeration of the red and white corpuscles and a differential leucocyte count. Wright's (or similar) stain you will find most satisfactory. Occasionally pneumococci may be detected in the preparation. Cultures should be made early, and repeated whenever special information is required as to the characteristics of the pneumococci. The blood should be obtained from a vein at the bend of the elbow: the skin should be scrupulously cleansed and the needle or syringe perfectly sterilized. Three to five cc. of blood to 100 or 150 cc. of plain or glucose bouillon is a desir-

Scheme of critical examination

able proportion. With every opportunity, and in special cases the opportunity should be made, the serum should be examined for urea. Whenever hemoglobin appears in the urine the serum of the blood should be examined for hemoglobin. The daily examination of the urine should include, especially, the quantity in twenty-four hours, total solids, total urea, total chlorides, total sulphates, proportion of phosphates, proportion of indican, and casts.

The pneumococcal toxin must be one of extraordinary virulency. We have all marveled at the profound impression made upon the patient's system by the introduction into the nutritional fluids of the body of an infinitesimal quantity of the pneumococcal toxins, and these diluted beyond computation, as evidenced by the profound chill, raging fever, complete prostration and other equally notable phenomena. Among the latter the first to attract attention is the remarkable reduction of the arterial tension, which is one of the earliest and most persistent of the symptoms of the disease. This is probably an efficient provision of Nature for mobilization of the reserve army of leucocytes into the circulatory current for the purpose of protecting the tissue cells from the irritating and paralyzing effects of the pneumococcal toxins.

Certain other consequences of this capillary paresis may be noted:—The blood with each ventricular systole is directly projected through the capillaries into the veins; the venous system becomes overfilled while the arteries become correspondingly underfilled; capillary osmosis is greatly reduced and the extravascular serum becomes more or less stagnant; the tissue cells lack their accustomed stimulus, are insufficiently nourished and are constantly bathed in a solution of their own waste; later, with returning vascular tone, these waste materials will enter the general circulation. It should be here noted that as the malady progresses, with rapid multiplication of bacteria and greatly increased production of toxins, the effects above noted are not correspondingly intensified. This may be due to a variety of causes, as, e. g., temporary paresis of the hypothetical sensitive horns of the nerve cells; simple accommodation to an irritant; intra-vascular retention of toxins; dilution, or deterioration, of those held extra-vascularly; their absorption by protecting cellular elements; their neutralization by leucocyte secretions.

Under these circumstances what shall we do? Shall we assume that Nature is right, but incompetent, and, following her lead, attempt to further facilitate the escape of the blood through the capillaries by the administration of such agents as nitro-glycerine, iodide of potassium, veratrum viride, etc.? Shall we presume that Nature is mistaken and attempt to correct her error by having prompt recourse to adrenalin, digitalis, etc.? Shall we assume that Nature is correct in theory and practice, or shall we acknowledge our ignorance in the premises, and in either case forbear active interference? These are practical questions of great importance. Practically I am inclined, in the ordinary case, to supplement the evident efforts of Nature by giving, *during the first few hours only*, two or three drops of fluid extract of veratrum viride every one to three hours until slight nausea has been induced, or the initiatory surprise of the attack has passed.

Veratrum viride

This remedy, a variety of which was used by Gessner in the VI. century, was brought into considerable prominence by Norwood and other American physicians in the second third of the last century. In pneumonia it quiets and retards the excited and rapid heart, while increasing the volume of blood forced through the arteries without increasing the peripheral tension. If the tincture is used it should be noted that the last revision of the U. S. pharmacopœia has reduced the strength seventy-five per cent.

Aconite, iodide of potassium, nitro-glycerine and other agents having similar actions offer no advantages over veratrum viride.

Venesection

In those cases with increasing nervous perturbation, exalted temperature, circulatory excitement, cerebral and general congestion and thoracic oppression during the first or second day, moderate or free bleeding—twelve to twenty-four ounces—should be practised. By this procedure the pneumococci and their toxins are immediately reduced by a moderate or considerable proportion. If now liquids are largely introduced into the circulation, by the mouth, by the rectum, or by hypodermoclysis, the remaining morbid matters are further diluted. Blood-letting at this time gives great and speedy relief, apparently bridging over a period of stress until the system, in the ordinary course of events, accommodates itself to the pathological burden. This procedure I have practised a great many times under these circumstances and always with satisfaction; never with regret. Venesection is not required in every case; the patient should be selected most carefully; likewise the conditions and the time. You should not bleed the very young, the very old, the anemic nor the weak.

One hundred and sixty years ago Cleghorn observed that which holds true to-day, namely, that in pneumonia the temperature rises, in the afternoon, to the 102d, and in severe cases

Temperature

to the 104th, degree of the Fahrenheit scale. There can be no doubt that, as a rule, high corporeal temperature marks the severe case, but it does not necessarily follow that the exalted temperature is in itself detrimental and should be directly reduced. Nevertheless I am quite sure that, generally, patients who have much fever are rendered more comfortable by some of the measures which may be employed with an antipyretic effect, and I therefore recommend their use.

Heat reducing means

Antipyretics

Of the legion of antipyretic measures I may mention the following as most worthy of confidence:—The ice cap, or cold water coil, more or less persistently applied. The cold water coil applied to the chest or abdomen; surrounding the patient, not too closely, with bottles of cold water. Sponging with cool water; sponging with warm, or hot water, followed by a cloth dampened with alcohol, with more or less exposure to the air, still or in motion, to promote evaporation; these to be repeated more or less frequently as required. These measures I have found sufficient in the vast majority of cases. In some cases, during the first, possibly the second day, four grains of acetanilid every three hours until three or four doses have been given; in addition to reducing the temperature moderately it will have a happy effect in relieving the headache and general aching which are so often present at this time; later it should not be used. In the exceptional case, with persistently rebellious high temperature, we may apply to the surface, wherever the skin is thin, fifteen to twenty-five drops of guaiacol; twenty drops is a fair initial dose, which may be increased at subsequent applications if required to produce the characteristic fall in temperature and sweating; once the proper dose has been found it will not be necessary to either lessen or augment it. The gradually rising high temperature of the terminal stage can not be safely reduced by any means.

In this connection cold packs, cold baths, aërial refrigeration, quinine in large doses, the legion of coal tar preparations, etc., are only mentioned to caution you against their employment as antipyretics.

Pain

The pain of early pneumonia is usually severe and distressing; sometimes agonizing. It gradually subsides and ceases spontaneously within three days. It will be moderately relieved by the initial small dose of morphia which I have recommended. During the first two or three days we may, with benefit in some cases, apply one or two strips of adhesive plaster to the affected side, extending the ends somewhat beyond the sternum and spine, so as to limit the extraordinary and painful respiratory excursions induced by the cough.

Inasmuch as the pain may be entirely relieved by morphia, and because relief in this manner is recommended by many authors, I consider it my duty to enter an emphatic protest against such treatment. Morphia given in sufficient quantity to relieve the pain throughout the painful period will obscure the symptomatic field, dangerously paralyze the nervous reflexes and induce a false sense of security which, I believe, distinctly jeopardizes the patient's life. It is true that the minute dose advised may be repeated once or twice in the exceptional case, yet in my own practice this is seldom indicated.

The local application of heat often mitigates the pain, and if it accomplishes this object it may be used. The same may be said of ice bags.

Local measures

Leeches, dry or wet cups, sinapisms, stimulating liniments, blisters, fomentations, poultices, etc., I do not use. Neither do I employ the so-called pneumonia jacket. It may be said of many of these local applications that they are simply useless; others are harmful.

During the early days of the attack the cough is usually frequent and painful; later it may be severe and distressing. For the relief of this symptom I direct that the temperature and moisture of the air in the sick room be maintained very equably, and that in every way the patient be kept as quiet as possible. The patient, by having his attention directed to the fact, and by reasonable encouragement, may exercise a very considerable restraint over the cough.

Cough

The early small dose of morphia, and the strapping of the affected side will relieve, somewhat, the cough. Codeine may be used with reluctance; I have seen no case in many years in which it seemed indicated. Heroin I consider very objectionable. The same may be said of Dover's powder and other deceiving preparations of opium. Terpine hydrate has been reputed useful; I have used it many times without having observed beneficial results. Inhalations of chloroform have had their day. The bromides, and sedatives generally, are to be condemned. Should I encounter a case requiring a cough-restraining remedy my choice would be in favor of minute—one-sixtieth grain—doses of morphia, with a drop of chloroform, in a pleasant syrup; such cases, I am sure, are very rarely encountered.

The so-called expectorants, of which iodide of potassium is probably the only one of real efficiency, I do not employ.

The questions which I have presented are those which will demand consideration, and decision, very early in the attack, but others arise with surprising promptitude. For example:

after the initial nervous shock has been relieved the veratrum viride should be discontinued, with the question of interference, or non-interference, in the circulatory disturbance again before you for consideration. My own practice is to now give small doses—ten to fifteen drops—of a reliable tincture of digitalis every four to six hours. Later, with any evidences of further vaso-motor paresis, the dose is increased to twenty to thirty drops and the interval, possibly, shortened. The object being to keep the arterioles and capillaries stimulated to moderate contraction, and the dosage and frequency of administration modified from time to time as required to produce this effect. In times of special need the dose may be large, as, e. g., forty to sixty drops, which may be given hypodermically, provided a non-irritating tincture is employed.

Circulatory tonics

Leucocytosis

Leucocytosis, particularly manifested by a large proportional and absolute increase in the polynuclear cells, appears promptly upon the advent of pneumonia, and continues throughout the attack. The eosinophiles are practically driven out of the peripheral circulation, their reappearance coinciding with the earliest decline in pathogenic activity. To any one who gives the subject observing and reflective consideration it must be evident that leucocytosis plays an important protective rôle, although the exact nature of this defense may not be known. It is probable, however, that these mobile secretory glands discharge their faintly alkaline secretion into the sanguineous serum, where it acts upon the pneumococci and pneumotoxins, and finding their way without the vessels acts in a similar manner in the extravascular toxins. Now it is well known that in some cases leucocytosis fails to appear, or is slight and inefficient; also that in such cases the death rate is, with exceptions, greatly in excess of that pertaining in those accompanied by leucocytosis to the ordinary degree. From these facts it is reasonable to conclude that it were best for us to stimulate leucocytosis, if possible, in those cases in which it is deficient. This I believe can be accomplished, without risk, by the use of nucleinic acid, and I therefore give, in these cases only, one-half to one teaspoonful of a five per cent solution every three to six hours as required to produce the desired results.

Oxygen

As the result of some desultory observations which I have made during the past five or six years I am prepared to say that in many, if not in a great majority, of cases in which nucleinic acid is given it will be found that the blood platelets will be reduced in number and the coagulability of the blood noticeably diminished. Might this agent not be properly employed for the purpose of preventing the formation of cardiac and vascular thromboses? This I can only offer as a suggestion. Because of their known tendency to increase the proportion of blood platelets, and the coagulability of the blood, lime and gelatine should not be used in pneumonia.

None of the pneumonic phenomena are more remarkable than the great diminution, or disappearance, of the chlorides from the urine. This is probably due to their being required in the system for purposes of defence against the pneumococcal toxins, or the pneumococcus itself; or for the retention of diluting liquids in the extra-vascular spaces. Should we emphasize these efforts of Nature and systematically use sodium chloride as a therapeutic agent? This I answer affirmatively, and advise you to give it with such freedom, by mouth, by rectum, or hypodermically, that it will not disappear from the urine. Personally I prefer to find a moderate amount of chlorides in such urines.

At this time, *before it is required,* have on hand a supply of oxygen. It will probably not be needed early, but it is so useful at the very beginning of respiratory embarrassment due to defective aëration, and its employment is so likely to be then neglected, if not at hand, that I consider this preparation of prime importance. You are now ready to make use of this agent, freely and frequently, at the very beginning of that slight but steadily progressive increase in frequency and shallowness of breathing which when observed by the experienced practitioner fills him with well-founded apprehension. When once begun oxygen will probably be required until convalescence has been declared.

The measures which have been mentioned will be found applicable, with modifications, to the ordinary case during the first two or three days of the attack. Beyond this adaptations, deletions and additions may be required; certainly the physician should sharpen his wits and redouble his watchfulness in order that he may anticipate, and not simply recognize, the earliest manifestations of those portentous conditions which often appear with such remarkable celerity. For example:—

Sleeplessness

In some cases early disturbed sleep may become marked insomnia, usually with an unimpaired, or even sharpened intellect —an ominous symptom indicating profound toxemia. To successfully combat this condition will tax to the full one's therapeutic resources. My own practice is to, early or in anticipation, give a saline cathartic, the action of which may be expedited by a stimulating enema; follow with a minute, or small, dose of morphia, hypodermically, and one or two cups of coffee; later give ten grains of trional, and an additional five grains if not asleep in an hour.

In these cases you will often find evidences of intestinal putrefaction, and for this reason there should be given, in addition to the saline, some intestinal antiseptic, as, e. g., salol in small doses. In some of these cases, happily rare, there occurs, late, an uncontrollable, fetid diarrhea, which may become involuntary and usually ends with the patient's death. The sudden onset of this diarrhea is often unexpected, although it is only the culmination of an intestinal sepsis which could have been readily detected, and probably corrected, if it had been looked for. In my opinion no case of pneumonia is properly managed in which careful and frequent investigations of the functional activity of the gastro-intestinal canal are not made. In these cases the urinary sulphates, and indican, are always increased, sometimes to an enormous extent. Prophylactic management should be the rule; when recognized energetic treatment should be promptly instituted.

Gastro-intestinal tract

Delirium

In another class of cases there occurs, after the height of the attack has been reached, a delirium which gradually increases in intensity, which also depends upon toxemia, although it is quite clear that the character of the toxemia is fundamentally different in the two classes of cases; the management should be much the same.

In these cases of delirium I have had some excellent results from free bleeding, followed by normal salt solution by the mouth—in the form of weak broths—by the rectum, or by hypodermoclysis. Ordinarily I attempt to anticipate the advent of the condition with one or two large doses—thirty to sixty drops—of tincture of digitalis.

Alcoholism

The victim of chronic alcoholism who harbors the pneumococcus in his upper respiratory tract is frequently attacked by pneumonia. Such patients often have, early, that peculiar form of delirium known as delirium tremens. This condition, in pneumonia, is one of great gravity, and demands most considerate care and mature judgment. The patient should be constantly watched, because he almost always imagines he is beset and pursued by imminent dangers and cunning enemies and he often seizes the first opportunity to escape. He will usually require restraint, and this may be given by the nurse in some cases; in others he may be restrained by securely fastening the bed coverings to the sides of the mattress; in some others mechanical restraint will be found necessary, and is the most humane. Digitalis, in large doses, I always use. To procure sleep, chloral, carefully administered, is probably the safest hypnotic. My practice is to give fifteen grains the first dose, followed by seven and

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Sleeplessness

...gradually—rarely suddenly—de... with abdominal distention and ... denotes a very dangerous, but not ... In such cases you should be alert in ... in the application of proper remedies ... enema of glycerine, sulphate of magnesia ... advised, and make use of the rectal ... to stimulate intestinal peristalsis and relieve the canal from accumulated gases. Give one-twentieth grain of strychnia, hypodermically, every two to four hours; give digitalis and caffeine in large doses, provided they can be absorbed; give by deep injection, a hypodermic syringeful of the camphor solution which you have already had at hand for such an emergency; early it will be well to bleed and do a hypodermoclysis.

Pulmonary edema

Pulmonary edema is an occasional event which, notwithstanding its very serious nature, may appear early enough to permit of prompt relief. Let me ask you to recognize it promptly. At the very beginning raise the foot of the bed as heretofore directed, in order that the serum may flow, uninterruptedly, out of the bronchi and alveoli; give one-twelfth grain morphia, one one-hundred-and-fiftieth grain atropia and one-thirtieth grain strychnia, hypodermically; give by deep injection the camphor solution; give by the mouth a large dose of digitalis; give the stimulating enema. Repeat, with proper modifications, as required. Energetic stimulation of the capillaries and arterioles by frequent hypodermics of adrenalin, in 1 to 10,000 solution may be required.

Late the appearance of profuse, probably cool, perspiration is an ominous, but not altogether hopeless, symptom. The condition is probably akin to that of pulmonary edema and requires a prompt appeal to a similar line of management.

Cardiac failure

Cardiac failure, which is not a simple but is a highly compound and complex condition, is the marked feature of nearly all fatal cases. The foundation for this unfortunate condition is laid at the very beginning of the attack, the entering wedge being the vaso-motor paresis which speedily transfers a great excess of blood from the arterial to the venous side of the circuone-half grains every half hour until the patient is asleep. At the same time give one-half to one pint of hot milk, and if possible, an enema of one-half to one pint of normal salt solution. With evidences of collapse give aromatic spirits of ammonia by the mouth, the previously advised camphor solution by deep injection, strychnia and one or two minute doses of morphia hypodermically.

Intestinal paresis

In some cases, late, there gradually—rarely suddenly—develops an intestinal paresis, with abdominal distention and inability to pass flatus. This denotes a very dangerous, but not necessarily hopeless, state. In such cases you should be alert in your observations and ready in the application of proper remedies. Give the stimulating enema of glycerine, sulphate of magnesium and water heretofore advised, and make use of the rectal tube as often as required to stimulate intestinal peristalsis and relieve the canal from accumulated gases. Give one-twentieth to one-thirtieth grain of strychnia, hypodermically, every two to four hours; give digitalis and caffeine in large doses, provided they can be absorbed; give by deep injection, a hypodermic syringeful of the camphor solution which you have already had on hand for such an emergency; early it will be well to bleed and do a hypodermoclysis.

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Complications

Let us now shortly consider some of the more important complications which may arise during an attack of pneumonia. Pleurisy with serous effusion rarely demands active treatment; when it does the liquid should be withdrawn, under the strictest antiseptic precautions. Do not be disappointed, however, if the effusion quickly reappears, for this it usually does, until after the lapse of several weeks, when it disappears spontaneously. Purulent effusion—empyema—may be an early feature, although it is oftenest recognized after an initial defervescence, and is often confounded with "delayed resolution." In all cases in which defervescence is unduly delayed, or in which the fever returns, I am led, by my observations, to explore with the utmost thoroughness the pleural cavity and the interlobar spaces for the presence of pus. When found prompt and efficient surgical measures of relief must be given.

Pericarditis with embarrassing effusion should be promptly discovered and relieved by aspiration, with later incision and drainage if required. Endocarditis, usually ulcerative, occurs sufficiently often to be carefully looked for in all cases. Unfortunately it is not always detectable; but in any case with prolonged and undue weakness, possibly with slight and irregular fever, the question should be given especial consideration; if any doubt exists as to the diagnosis you should act as if it were clearly present. When detected the patient should be kept in bed, in the recumbent posture and with absolute rest, for at least six weeks. The rest should be so profound that the patient should make no voluntary movements—not even turning in bed, raising his head, etc.

Arthritis, suppurative peritonitis, etc., require early—conservative—surgical treatment.

The line between impending and beginning death is an indistinct, nevertheless a most important, one. Threatened, or impending, death may sometimes be averted by the masterly employment of the measures heretofore mentioned, and others, but this is probably impossible in the case of beginning death. Here, as a rule, the respiratory reflexes are weakened in proportion to the danger. Now a dyspnea which is readily recognized by the observer, but which is not appreciated by the patient, is of grave augury, and when this is accompanied by a rising and falling of the trachea, and a non-obtrusive clicking noise with respiration, and which returns almost immediately after coughing, the patient has, in my experience, invariably died. So far as I am aware this symptom antedates all others which denote the approach of death.

On the other hand when, late in the attack, the patient awakens from sleep and sneezes, or yawns, or stretches, his safety is assured.

In conclusion:—The treatment of pneumonia may be faultlessly exemplary; it may be carelessly useless and harmless; it may be reprehensibly pernicious. The fundamental principles of proper management may be stated, analyzed and formulated, but their application to meet the exigencies and requirements of the individual patient is an art which can not be transferred from one physician to another. Satisfactory proficiency in this art can be attained only by those who add to native capacity a keen perception of pertinent facts, close study of the problem and years of observant practice. Failure is usually traceable to inherent incapacity, paucity of necessary knowledge and restricted experience.

TYPHOID FEVER.

There is no specific treatment for typhoid fever. Injections of typhoid bacilli, grown on thymus bouillon and destroyed by heating (Fränkel), injections of dried bacillus pyocyaneus and of various typhoid sera that have been prepared, have so far failed to exercise any appreciable effect upon the course of the disease.

No specific

It is not possible to abort or jugulate typhoid fever by the use of any remedy given by mouth. Intestinal antiseptics, while they may be capable in the test tube of holding the development of typhoid bacilli in check and if used in sufficiently strong concentrations to destroy them, could not exercise this effect in the living without serious detriment to the patient. The use of intestinal antiseptics cannot be condemned as useless, however, in typhoid fever, and some clinicians claim that they are capable of favorably modifying the bacterial flora of the intestine and hence forestalling or checking to some extent mixed infection and auto-toxemia. The different intestinal antiseptics have been fully discussed in previous sections (see page 206 and page 416). They are incapable of curtailing the duration of the disease and I consider their efficacy as quite problematical.

Intestinal antiseptics

Of all intestinal antiseptics calomel, if given early in the disease, is the most useful one, and it seems to exercise a favorable effect in some cases upon the development of the local lesions in the intestine. It is best to give calomel at once in two or three doses of four or five grains. Later in the disease calomel is rarely indicated, excepting possibly in severe cases of meteorism in which small (one-quarter or one-half grain) doses, given two or three times a day, are useful. Yeast is also used extensively to modify the intestinal flora, and the results occasionally observed from the use of this remedy are sufficiently encouraging to warrant its employment in typhoid fever. It can certainly never do any harm. Yeast, in contradistinction to calomel, should be given throughout the course of the disease.

Calomel

Yeast

With the exception of remedies that are occasionally necessary to treat cardiac failure, intestinal hemorrhage, profuse diarrhea, distressing cerebral symptoms, etc., drugs altogether have a very subordinate place in the treatment of typhoid fever.

Now and then it becomes necessary to use antipyretics in those cases in which the fever is very high and does not yield promptly to hydrotherapeutic means, or in which the patients bitterly object to the use of hydrotherapeutic measures,

Antipyretics

so that an attempt must be made to relieve them for a time of the necessity of being bathed or sponged. Judiciously given certain antipyretics reduce the blood temperature, quiet the heart, free the sensorium, promote sleep, encourage the appetite and often increase the patient's comfort. Only two antipyretics can be considered safe, namely, quinine and lactophenin. Antipyrin, acetanilid, phenacetin are generally dangerous in typhoid fever, for if given in doses sufficiently large to reduce the temperature appreciably they increase the stupor and depression, reduce the flow of urine, weaken the myocardium and often produce chills, sweats, cyanosis and collapse.

Lactophenin

Lactophenin, however, is the one phenacetin derivative that, in my experience, can be safely used in typhoid. It should be given in doses of ten to fifteen grains four or five times in the twenty-four hours. It generally produces a drop of two or three degrees in the temperature, and induces sleep and euphoria.

Quinine

The best and the safest antipyretic drug of all is quinine. It should be given in the dose of fifteen to forty grains in two or three divided doses inside of two hours in the evening every other day. Within ten or twelve hours a temperature drop of two or three degrees is usually brought about, so that the temperature on the next morning is low. During the course of the day the temperature slowly rises again, but rarely reaches the same height that it would have reached if quinine had not been administered the evening before. During the quinine days bathing or sponging should not be instituted. Occasionally disagreeable, but not dangerous, symptoms, as buzzing in the ears, tremor, lightheadedness, and diarrhea may follow the use of quinine.

Diet

The most important elements in the treatment of typhoid fever are the diet and hydrotherapy. The diet should be exclusively liquid during the fever period, and for a week or ten days thereafter. The food should be digestible (see page 347), non-irritating to the bowel and it should leave a small residue.

Milk

The ideal food in typhoid fever is milk. It should be given in quantities of from two to three quarts a day, preferably diluted with water or lime water. In placing a typhoid fever patient upon a milk diet, the stools should be examined every day for curds, and if the latter appear the milk ration should be reduced, or, if necessary, stopped altogether. Some people have a marked aversion to milk. In such cases it is bad practice to force milk drinking and it is well to realize that the patient can very adequately be nourished for several weeks on a liquid diet if no milk is given or some of the other foods, to be presently described, are administered in its stead. An attempt should, nevertheless, be made to accustom the patient to the use of milk or milk foods. If the milk is given very cold in small quantities and at frequent intervals, many patients gradually learn to relish and to tolerate it. If this can be accomplished within a few days, then the amount of milk given at each feeding may be increased and the intervals of feeding shortened, so that in this way the full quantity may be ultimately administered. Occasionally the addition of a little coffee, or brandy, or egg to the milk renders it more palatable so that the patients can take it in this form.

Gruels

Eggs

Meat broth

In addition to milk diet and substitutes for milk, the patients may have gruels made from barley, arrowroot, rice and oatmeal, that are carefully strained and to which are added a little butter and salt. A little yolk of egg, or some meat juice, meat broth or meat extract as a flavor, or beef broth with egg to which is added flour made of wheat, rice, sago or barley, may be given.

Raw meat juice

One of the most useful preparations is raw meat juice made by expressing in a meat press beef that has been cut into small pieces. The juice is of a light-red color and possesses a slight acid reaction. As it readily decomposes it should be kept on ice and should be prepared fresh every twenty-four hours. The patient should receive from 100 to 200 grammes of this meat juice in the twenty-four hours. In order to administer this amount, one or two tablespoonfuls of the meat juice should be added to the ordinary broth, or to some of the milk preparations enumerated above. In addition a tablespoonful of the juice should be given every two or three hours throughout the day. Some patients have a great aversion to the meat juice and dislike its taste and odor. Here a peppermint lozenge chewed before the meat juice is taken often overcomes this repulsion.

Frozen meat juice

Another very elegant preparation of meat juice that is particularly useful in cases that cannot take the liquid preparation, and in patients who suffer from severe vomiting, is frozen meat juice. Ziemssen recommends the following method of preparing it: 500 cc. of fresh meat juice are sweetened with 250 grammes of sugar and flavored with 20 cc. of lemon juice and about 20 cc. of brandy; to this mixture are added three yolks of egg and a little vanilla. It is then frozen in an ice cream freezer.

Meat jelly

Meat jelly (see also page 37) made from chicken, veal or beef is also a very grateful food for some people. The meat is chopped up fine, heated in a casserole to boiling temperature without the addition of any water. The juice solidifies as soon as it cools off and can be added to ordinary meat broth and to milk foods. It is useful more as a flavor than as a food. Wine jellies or other gelatine preparations are a very welcome addition to the diet.

Liquids

The quantity of fluid nourishment and of water need not be limited. Broadly speaking the more liquid a typhoid patient will take, the better. One should never wait until the patient manifests a desire to drink water or to take liquid food, but small quantities of liquid should be offered at frequent intervals, not to exceed half an hour, throughout the day, and, if the patient is awake, also during the night.

Alcohol

Alcohol is a very useful food and stimulant and may without detriment be given throughout the course of the disease. It may be administered in the form of dilute white wine or brandy in water, or in the form of the very useful Stokes' brandy-egg mixture consisting of 50 cc. of brandy, two yolks of egg, 150 cc. cinnamon water and 25 cc. of simple syrup. This quantity should be administered in divided doses in the course of twenty-four hours. Many patients enjoy hot tea with a little rum or a little champagne. Claret or burgundy should not be given cold, because a cold alcoholic solution of tannin is irritating to the walls of the stomach and bowel. Given hot, however, burgundy flavored with sugar, cinnamon and cloves is a very useful stimulant and astringent and acts particularly well in meteorism; 250 to 500 cc. of this drink may safely be given. Lemonade is a very useful beverage, especially as the ethereal oil of the lemon stimulates the flow of saliva and hence keeps the mouth moist.

Hydrotherapy

Hydrotherapy occupies the most important place in the treatment of typhoid fever. Water treatment acts favorably not only by reducing the temperature but by exciting the nerves of the circulatory apparatus, by its action on the vaso-motor system and by its stimulating effect upon the nervous elements supplying the various organs. It counteracts functional inadequacy and parenchymatous changes in many important organs that are commonly affected in typhoid fever. The vaso-motor effect is particularly important in all infectious diseases; in typhoid fever especially as there is always danger of paralysis of the vasomotor centres. Upon the respiratory centres cold hydrotherapeutic measures also exercise a very pronounced effect. By means of cold applied to the surfaces of the body deeper breathing is generally produced and as the heart's action is at the same time strengthened, the occurrence of bronchitis and pneumonia is effectually prevented. Upon the nervous system hydrotherapy also has a most pronounced influence. It is the sovereign remedy to rouse patients from the stupor they are apt to lapse into in typhoid fever. Hydrotherapy judiciously applied improves the appetite, promotes sleep and by keeping the patient aroused and active renders his care easier, prevents decubitus and, to a certain extent, the development of disagreeable mouth complications when the stuporous, somnolent patients no longer voluntarily perform swallowing or chewing movements.

General rules

The following general rules in regard to the application of hydrotherapeutic means may be formulated: The thermic stimulus should be as energetic as the patient can tolerate and it should, in every case, be reinforced by producing artificial dilatation of the cutaneous vessels by friction of the patient's skin while he is immersed in the water. It is good practice to begin with mild hydrotherapeutic means and then gradually to adopt more severe ones or not according to the individual reaction of the patient. Many methods of hydrotherapeutic treatment in infectious diseases can be adopted.

Brand treatment

In hospital practice the severer methods are commonly employed, especially the orthodox Brand treatment, which consists in giving the patient a full bath of 70° F. to 64° F. for ten minutes as soon as the temperature rises over 103½° F., five to six of such baths being given a day. In private practice this method is more difficult to carry out because it requires a movable bath tub or a bath tub kept permanently in the patient's room, and also requires one or two assistants to transport the patient into the bath and back into bed again. In addition the patients generally bitterly complain of this treatment and object to it seriously. Moreover, it is questionable whether this severe method possesses sufficient advantages over milder ones to warrant its employment. The fear of the patient and his opposition to these cold baths are not without detriment on account of the nervous excitement this opposition produces; hence, if the full bath plan is to be adopted at all it is usually better to use water of moderately high temperatures in the beginning. Here it is necessary to strictly individualize before instituting a routine bath treatment and the individual reaction of the patient to the different temperatures should always first be determined. One can begin safely with immersion of the patient in water of 89° F. to 82° F. (32 to 28° C.) and then gradually cool the bath water off to 75° to 68° F. (24 to 20° C.). If the patient is very anemic or very sensitive, or if symptoms of collapse appear, then the temperature should not be allowed to go below this point. If the patient develops a chill while in the bath he should be immediately removed. No attempt should ever be made to reduce the temperature below normal, in fact, it is always a safe plan to limit the reduction of the temperature to about two or three degrees Fahrenheit, the patient remaining in the bath for fifteen to thirty minutes, not longer. As soon as the patient is placed into the water energetic friction of the surfaces of the body should be performed, and this should be kept up during the whole time that the patient is in the water. If there is much respiratory difficulty, the patient suffering from bronchitis or pneumonic symptoms, then cold water should be poured over the head, neck, chest and back at the end of the bath. In this way a few deep respirations are stimulated that, as stated above, act beneficially in counteracting the congestion in the respiratory apparatus.

The drop of temperature rarely persists for longer than three hours after the bath, consequently, in order to produce a permanent antipyretic effect it becomes necessary to give five or six of such baths during the twenty-four hours. In this way the average temperature can effectually be kept down two or three degrees.

On removal from the bath the patient may either be wrapped, without drying, in a linen sheet and covered with a thin woolen blanket, and after a rest of fifteen to twenty minutes, the surfaces of the body may be dried and a dry nightshirt put on. If the temperature has been reduced over two or three degrees, Fahrenheit, however, it is usually better to rapidly dry the patient and to wrap him in a warmed linen sheet. Both before and after the bath the patient may to advantage receive a stimulant, consisting of a little wine or a few teaspoonfuls of hot coffee. That the patient should be carefully transported into and removed from the bath need hardly be emphasized. Contra-indications to the bath treatment are hemorrhage, perforation, peritonitis or impending heart failure and collapse.

Wet pack In private practice, and particularly among the poorer classes who cannot secure adequate bathing facilities, the wet pack may take the place of the full bath. This method of water treatment does not exercise so pronounced an antipyretic effect, as the full bath, but acts very beneficially nevertheless. The wet pack is best administered as follows: A large linen sheet is wrung out of water of 50 to 54° F. (10 to 12° C.), the patient rapidly wrapped into the sheet and allowed to remain in this packing for six to ten minutes. At the end of this period a second wet pack is applied and this procedure repeated three or four times. It is good practice to leave the patient in the last pack for fifteen to twenty minutes. The most practical method of carrying out this plan is to have two beds and to transport the patient from one wet pack into the other.

Sponging A third method, and one that may be applied as a routine measure in every case of typhoid fever, immaterial whether the temperature rises above 102½°F. (39° C.) or not, is sponging of the surfaces of the body with cold water of 50 to 54° F. (10 to 12° C.) or with ice water to which may be added a little vinegar or alcohol. By carefully going over the whole body with a cold sponge every two or three hours the temperature can always be somewhat reduced, and, above all, a beneficial stimulating effect can be obtained. After the sponging the patient should, of course, be carefully dried and covered with a linen sheet and a thin woolen blanket.

It is useless to designate the many other methods of hydrotherapeutic treatment by means of half-baths, partial packs, etc., that have been described. The lukewarm full bath gradually cooled and combined with friction and cold douches, the wet pack, and sponging, always suffice to produce the desired result.

COMPLICATIONS.

Nervous complications

Certain complications of typhoid fever require particular discussion. About the nervous system the symptoms may either be those of depression or of excitement. The stupor and somnolence are best combated by the use of cold douches given in a lukewarm bath and the application of an ice bag or a Leiter coil to the head either permanently or interruptedly. The symptoms of excitement and meningeal symptoms manifesting themselves by severe headache, delirium, restlessness, insomnia, etc., are best treated by lukewarm baths or, in extreme cases, by hot baths. While the patient is immersed in the warm water, an ice bag or a Leiter coil should always be applied to the head. In cases of insomnia or headache that do not yield readily to these simple hydrotherapeutic means, trional, sulphonal or lactophenin may occasionally have to be given. Opium and morphine, however, preferably the latter given hypodermically in doses not to exceed one-fourth of a grain, two or three times a day, are the best remedies.

Circulatory failure

One of the chief dangers in typhoid fever is circulatory failure, either gradually progressive or sudden. The tendency to heart failure, manifesting itself by a rapid small pulse, low blood pressure, a cool skin, a pale face and later cyanosis, must be energetically counteracted by various remedies. Best of all in the gradually developing cases is alcohol administered in the form of brandy, hot claret with spices or, better yet, champagne, the latter to be given in liberal doses. Strychnine, too, given in doses of one-thirtieth of a grain every three or four hours is a useful remedy in this condition. Digitalis should be given with great care and preferably not at all on account of the danger of myocarditis (see page 30). In sudden heart failure, camphor is the sovereign remedy. It may either be given in ten per cent. ethereal solution in the dose of ten to twenty drops hypodermically, and frequently repeated until the heart's action improves, or in the form of a ten or twenty per cent. solution in sterile olive oil, a syringe full of this solution to be injected hypodermically every one and one-half to two hours. Adrenalin chloride, in ten per cent. solution, twenty to thirty drops hypodermically, also occasionally aids in combating sudden heart failure. The ice bag over the heart, or a Leiter coil, preferably applied intermittently, is also useful in these cases.

Diarrhea

Certain symptoms about the intestinal tract may require special attention, particularly diarrhea and meteorism. If the patient has four or five liquid stools a day this mild form of diarrhea requires no special treatment, but if more than five movements in the day are deposited, then the frequency of the motions should be reduced. The best remedy is opium, which should by preference be given per rectum in a starch enema as follows: Ten to fifteen drops of the tincture of opium dissolved in two ounces of starch water (one tablespoonful of starch to eight ounces of water) should be injected every two or three hours through a high rectal tube until the diarrhea is checked. It is best to refrain from the administration of opium or tannin by mouth on account of the irritating effects these remedies exercise upon the gastric mucosa. Bismuth subnitrate in ten to fifteen grain doses, given every two or three hours, may, however, to advantage be combined with the rectal opium treatment.

Meteorism

Excessive meteorism (see also page 461) is a very distressing symptom and one that it is difficult to treat. The expulsion of the gas may frequently be promoted by inserting a high rectal tube and in this way preventing the contraction of the sphincter. A Leiter coil or an ice bag should be applied to the abdomen in some cases while in others hot applications, especially flannel cloths wrung out of hot water to which a few drops of turpentine are added, are more grateful to the patient and more effective in overcoming abdominal distention with gas. Enemas of warm physiological salt solution, containing from three to five drops of turpentine to the quart, may be injected and drop doses of turpentine, preferably in a little milk, may also be given by mouth.

Constipation

Constipation is usually a negligible symptom unless it persists for more than two or three days. It does not often supervene if the initial large dose of calomel mentioned above is given. It is always best to attempt evacuation of the bowels by soap suds or turpentine enemata. If any laxative is given it should be a saline, i. e., a Seidlitz powder, magnesium or sodium sulphate.

Hemorrhage

Hemorrhage from the bowel (see also page 439) requires energetic treatment. The patient should be put completely at rest, bathing or other hydrotherapeutic means stopped, and for twenty-four hours all food and drink withheld. Later, a little cold milk, ice pills to allay the thirst or a little bouillon, broth or dilute wine may be given. Ice bags should be applied to the abdomen. Styptics, given by mouth or hypodermically, or by rectum, are not of much value in controlling the bowel hemorrhage in typhoid fever. The different hemostatic drugs have been discussed on pages 439 and 440.

Perforation

Perforation of the bowel, with or without peritonitis, is usually a fatal complication. Every effort should, in typhoid fever, be directed towards preventing this accident by careful regulation of the diet, rest, avoidance of straining and coughing efforts, sudden movements, etc. After perforation has once occurred there is nothing to do excepting to keep the patient perfectly quiet, preferably with the aid of hypodermic morphine injections. In view of our helplessness from a medical standpoint to treat perforation, laparotomy and mechanical closure of the rupture should always be considered, especially if the accident is discovered early before symptoms of diffuse peritonitis have made their appearance. This operation has frequently been performed during late years and the results obtained in skillful hands have been so favorable as to warrant the adoption of this radical procedure in most cases. For the treatment of acute diffuse peritonitis I refer to the section on this disease (page 468).

Decubitus

Stomatitis

Decubitus is prevented by rigid cleanliness, by keeping the skin dry, by ordering the patients to frequently change their position. Upon the appearance of a bed-sore the air cushion should be used, the parts frequently bathed with alcohol, carefully dried and dressed with boric acid powder. The treatment and prevention of stomatitis has already been discussed on page 259.

Recurrences

The treatment of recurrences is in all essentials the same as that of the original attack. Here again hydrotherapeutic measures and the diet are the dominating features of the treatment.

DIPHTHERIA.

Antitoxin

The injection of antitoxic serum has rendered the treatment of diphtheria relatively simple. There is scarcely any need, as a rule, for the administration of internal medicines, excepting to treat the complications and sequelæ of diphtheria, and the latter, provided antitoxin is given early in the disease and in the proper dosage, are exceedingly rare.

The local treatment, that formerly occupied so large a place in the management of diphtheria cases, has become almost superfluous and intubation and tracheotomy are performed much less frequently now-a-days than formerly when laryngeal and tracheal diphtheria (croup) were common occurrences.

There is no longer any doubt that diphtheria antitoxin properly administered is the best remedy for the disease. Statistics in regard to the mortality under antitoxin treatment, and clinical studies in regard to the duration and severity of the disease under the influence of diphtheria antitoxin, demonstrate this conclusively. Under this remedy the course of the disease is, in a large majority of the cases, markedly modified, the membrane is loosened and sloughs off much earlier, laryngeal and nasal complications are prevented or promptly aborted, the general prostration and malaise are not so marked, and the temperature does not rise so high and returns to normal sooner than if the patient had been treated without antitoxin.

Hypothetical dangers of antitoxin

It has been claimed that antitoxin may cause heart failure, paralysis, albuminuria, nephritis and other complications. It is true that cardiac failure and paralysis occur as frequently in diphtheria cases that are treated with serum as in cases that are treated without serum; in fact, some statistics show that more cases of diphtheria (that survive) develop signs of heart intoxication when treated with antitoxin than without; but one is justified in assuming that these cases would have died had they not received the benefits of antitoxin treatment, so that the figures revealed by the statistics in regard to the occurrence of cardiac complications are exceedingly misleading and in no sense justify the conclusion that the serum produced the phenomena about the heart and the peripheral nerves.

The albuminuria, renal complications, urticaria, arthritis, etc., that sometimes follow the administration of antitoxin are due to the injection of large quantities of a foreign serum and not to the antitoxin itself; this is borne out by the fact that nowadays when small quantities of concentrated serum are used instead of the large quantities of dilute serum that were formerly employed, these sequelæ, notably, the albuminuria and the skin eruptions, are exceedingly rare.

Method of administration

The injection of antitoxin should be made into the subcutaneous tissues and not into the muscles nor into any of the superficial cutaneous veins. The best locations for the injection are the external surfaces of the thigh, the abdominal parietes and the upper pectoral region. Nowadays a sterile syringe of proper size and construction is furnished with each package of diphtheria antitoxin. If the syringe should become broken, or if the antitoxin is purchased without the syringe, then a large Pravaz syringe should be carefully sterilized and used for the injection. That the field of operation and the hands of the physician should be rendered aseptic by thorough scrubbing with soap and water and bathing with bichloride solution, alcohol and ether need hardly be emphasized.

Dosage

The ordinary dose for children under ten years is five hundred units, if given on the first day; a thousand units if given after the second day. In children over ten years, and in adults, a thousand units should be given at once and, if the symptoms are not very much improved in twenty-four hours, a second thousand units should be given and, if necessary, a third thousand at the expiration of another twenty-four hours. If the case is seen in an advanced stage, i. e., on the second or third day of the disease, or if signs of laryngeal involvement have made their appearance, then the first injection of a thousand units should be followed in six or twelve hours, according to the reaction of the patient, by a second thousand units, and in another six or twelve hours by a third injection of a thousand units. It will hardly ever become necessary to give more than three thousand units, for after this amount of antitoxin has been injected, and the patient fails to show marked improvement, further doses of antitoxin will be without effect.

Local treatment

The local treatment under antitoxin, as stated above, is very simple. Meddlesome spraying and swabbing of the throat is to be condemned, especially in children, for the excitement incident to the local treatment, and the struggles of the child, are decidedly detrimental; moreover, vigorous swabbing of the affected area is apt to produce local trauma and to throw the doors wide open for the invasion of septic germs and secondary involvement of various internal organs. Vigorous local treatment in the nose is especially to be condemned on account of the danger of producing middle ear infections. Besides, the escharotic effect of strong remedies applied directly to the diphtheritic area is apt to aid the absorption of the diphtheritic poison. Drugs strong enough to kill diphtheria bacilli are very apt to produce medicinal poisoning from the quantities of the drugs that are swallowed, or that are absorbed through the diphtheritic area. It is doubtful, moreover, whether strong germicides like sublimate, carbolic acid, ferric chloride, silver nitrate, lactic acid, creolin and others applied locally exercise any very strong bactericide effect, for the bacteria are usually protected from the action of the drugs by mucus and by lymph and albuminous fluids that readily coagulate when touched with these different remedies; the contact with the germicides, moreover, is really too short to be effective.

Swabs and sprays

Occasionally if there is much fetor, or if many pus germs are present, the throat may be swabbed or sprayed gently with a two to three per cent. solution of chlorate of potash; or with a one to ten per cent. solution of iodoform in glycerin; or with a mixture of equal parts of peroxide of hydrogen and water (if the latter drug is used, the lips, especially in children, should be protected with vaselin); or insufflations of iodoform mixed with sugar of milk in the proportion of one to three, or with bicarbonate of soda in the same proportion, may be employed. The chlorate of potash solution mentioned above may also be used as a gargle. A very popular solution for local application is Loeffler's, consisting of:

℞

Menthol,	10 gm.
Toluol,	36 cc.
Alcohol,	60 cc.
Liq. ferri sesq.,	4 cc.

Irrigation of nose and mouth

Best of all are irrigations of the throat every two or three hours with copious quantities of a one to two per cent. boric acid solution, or with a one-half to two pro mille salicylic acid solution. The child's head should be held forward over a bowl and from one to two quarts of the solutions allowed to run into the mouth from an irrigator hanging four to six feet above the child's head; if there is little membrane in the mouth, then the irrigation may be performed through the nose, although this procedure is not without danger on account of the risk of producing middle ear involvement.

Cold applications

Cold applied either externally or internally is generally very grateful and aids in allaying congestion and inflammation. The patients may either swallow ice pills at frequent intervals or may suck ice-cold beverages in small quantities through a straw. Externally, a Leiter coil (see index) is of the greatest benefit, or a permanent ice poultice may be used to advantage.

Drugs by mouth and inunction

Internally medicines are not indicated. Antipyretics especially are unnecessary and usually dangerous to the heart. In some clinics the use of mercury or of silver administered by inunction is popular and sufficiently favorable results are reported from this practice, especially before the antitoxin treatment was universally employed, to warrant the occasional use of this method, either as an adjuvant to the antitoxin treatment or as a substitute for it if antitoxin cannot be readily procured.

From fifteen to thirty grains (1 to 2 gm.) of Unguentum Hydrargyri are rubbed into the skin in different parts of the body each day, or fifteen to forty-five grains of the unguentum Credé are administered in the same way by inunction. The dose of either ointment may be increased somewhat on the third or fourth day. Inunctions should not be made about the skin of the neck, but in other parts of the body.

Hydrotherapy

Collapse

Hydrotherapeutic means have a very limited field of employment in the treatment of diphtheria. Cold hydrotherapeutic measures, instituted for the purpose of reducing the temperature, are to be condemned as superfluous if the diphtheria antitoxin is used, and as dangerous, especially to the heart, in any case. If the patient goes into collapse from heart failure, then immersion in hot water (100°) may be indicated as an emergency procedure. On being taken from the hot bath the patient should be wrapped in blankets and kept perfectly still in bed for several hours, while analeptics (see page 32), coffee, champagne, whisky, by mouth; ether, camphor, ammonia, caffein, hypodermically, may be used. Inasmuch as heart failure is apt to occur at almost any time during the course of diphtheria, and especially during the convalescent period, analeptic remedies should always be kept at hand for emergencies and the attendants instructed in their use.

Rest

Diet

A diphtheria patient should be kept at rest in bed and should not be allowed to make any sudden movements or to get up at all until the temperature is perfectly normal. The heart should be inspected daily and, if necessary, supported with a little wine or champagne. The diet should be very nourishing, contain an abundance of albuminous food and should be palatable. If the patient has much difficulty in swallowing it may become necessary to administer food either by the rectal route, the stomach tube or a nasal catheter.

Croup

Croup, since the introduction of antitoxin, is a rare complication. If the membrane forms in the larynx or the trachea, then inhalations of equal parts of lime water and distilled water through a steam inhaler are usually very grateful to the patient and aid considerably in loosening the membrane. Profuse sweating produced by pilocarpine hydrochlorid one-twentieth to one-half grain (0.003 to 0.3 gm.), hypodermically; by hot, wet packs; by the steam tent (see index) or by hot air, are considered efficacious in relieving the dyspnea and in promoting loosening of the membrane.

In nearly all cases the administration of antitoxin acts with particular efficacy in promoting shedding of the membrane. The expulsion of the membrane may further be facilitated by the use of emetics, apomorphine, ipecac, tartar emetic (see page 281).

Intubation
Tracheotomy

If despite the administration of antitoxin and the employment of steam inhalations, sweating and emetics the membrane continues to form or is not loosened and expelled, then intubation or even tracheotomy may have to be performed. Fortunately the necessity for this operation is becoming less and less. The description of the methods of intubating or tracheotomy does not lie within the scope of this book.

MALARIA.

Quinine a specific

Mode of action

The employment of quinine as a specific renders the treatment of malaria exact and simple. Quinine and its salts are protoplasmic poisons. They act more strongly, possibly specifically, upon lower forms of life than on the more highly organized cells of the human body; hence quinine in doses that do no harm to the protoplasm proper of the host possesses the power of destroying unicellular organisms like malaria parasites that invade it.

Mode of administration

Quinine preparations may be given by mouth, by rectum, hypodermically and intravenously. In the great majority of cases the administration by mouth is effective. If much gastric irritation develops from the administration of quinine by mouth, or if it is desired to obtain a somewhat more rapid effect, the administration by rectum in clysma or suppository may be adopted. If a still more rapid effect is desired the drug may be given hypodermically; and in pernicious forms of malaria when the patient is in danger of his life and an immediate result is desired, quinine may be injected into the veins.

Preparations of quinine to be given by mouth

Quinine hydrochlorid sulphate

Numerous preparations of quinine have been used. For administration by mouth the hydrochlorid of quinine is the best. Quinine sulphate is also very useful. The quinine hydrochlorid, however, contains percentically more quinine than the sulphate, it is also more rapidly absorbed, so that twice to three times as much of the sulphate must be given as of the chlorid in order to obtain the same effect.

In very nervous subjects and in individuals in whom the administration of quinine exercises an irritating effect upon the

Quinine valerianate and bromid

nervous system the valerianate or bromid of quinine may be given in place of the chlorid or sulphate. It will rarely be necessary to use these compounds, however, for if it is desired to secure a valerianate or bromid effect it is always simpler and safer to give the two drugs separately. This is especially true as quinine in order to be effective must be given in large doses, as will be presently shown, and because this task is rendered difficult if the drug is given in chemical combination with substances that cannot safely be administered in large quantities.

Euquinine

A very useful preparation of quinine is euquinine. This remedy is particularly useful for administration to children, as it does not possess the bitter taste nor most of the toxic properties of quinine hydrochlorid or sulphate, while it is quite as effective as any of the latter preparations. In giving euquinine instead of quinine salts about one-and-a-half parts of euquinine should be allowed in place of one part of quinine.

Administration in capsule and solution

Quinine hydrochlorid or sulphate are best administered in capsule or pill form. It is true that in solution the absorption of quinine is very much more rapid, but the bitter taste of such solutions, that is only poorly disguised by the administration of the drug in syrups or in watery solution flavored by various volatile oils or in coffee, is a serious deterrent to its employment in liquid form.

Hypodermic method

For hypodermic use the acid hydrochlorid of quinine (quinine bimuriate) is the best; it should be administered in ten to twenty grain doses dissolved in about 2 to 3 cc. of water. The neutral chlorid of quinine is not very soluble in pure water. If the solution is prepared with hot water, however, and if a little urea is added, the solubility of the quinine chlorid is increased and the injection is not quite so irritating.

Rectal method

For rectal use a little opium should be added to the quinine solution as quinine salts are somewhat irritating to the rectal mucosa. The solution may either be made with water or with mucilage and one of the following two formulæ can be utilized for preparing the clysma:

℞

Quinine hydrochlorid,	2.0 gm.
Tincture of opium,	10 drops.
Water,	100.0 cc.

Or

℞

Quinine hydrochlorid,	2.5 gm.
Tincture of opium,	10 drops.
Mucilage,	40.0 cc.

Intravenous method

For intravenous injections an acid solution of quinine cannot be used. The solution should be neutral. The best preparation is the following, recommended by Bacelli:

℞

Quinine hydrochlorid,	1.0	gm.
Sodium chloride,	0.075	gm.
Distilled water,	10.0	cc.

This solution is to be heated to body temperature and transfused directly into the veins of the fore-arm, as described in the Section on *Pernicious Anemia*, on page 75. The injection of such large quantities of quinine intravenously generally produces severe symptoms of intoxication, i. e., a bitter taste in the mouth, dizziness, tinnitus aurium, cold sweats, some precordial distress, palpitation and a feeling of oppression. These symptoms usually disappear promptly in from fifteen minutes to half an hour and are usually negligible. If the pulse becomes very weak and slow a hypodermic injection of ether, or camphor and ether, may be given.

Time to administer quinine

The treatment of the malarial paroxysms with quinine varies somewhat according to the type of malaria. Inasmuch as very large doses of quinine are apt to produce a variety of disagreeable symptoms as indicated above, it is desirable to produce the desired effect with the smallest possible quantity of the drug. For this purpose, especially in the simple quotidian type of malaria, it is important to administer the quinine in one or two relatively small doses at exactly the right time rather than indiscriminately throughout the day.

The simple intermittent type of malaria

The rules that should be observed in the treatment of the simple intermittent form of malaria are the following: Provided the patient has been observed for several days and it is known that the type of malaria is of the quotidian variety, or if the blood examination reveals this to be the case, then the patient should receive fifteen grains of quinine, twice, six and five hours before the time when the attack is expected. This therapy sometimes aborts the attack. In most cases, however, the administration of quinine on the first day does not stop the attack. If administered at the same time and in the same way on the second day, the attack is, in the great majority of cases, aborted. It is best then to continue the administration of thirty grains of quinine for two or three days more in the same manner. This is particularly necessary if a blood examination is not made and the type of malaria positively established, for it is important to remember that a daily malarial paroxysm may be due to three colonies of quartana, so that here it would be necessary to administer the dose of quinine for at least four or six days if the parasites are to be destroyed in the amebic stage.

To abort an impending attack

If the patient is seen for the first time, when the attack is just impending, and if the first attack occurring on the preceding day was exceedingly severe, so that it is desirable to prevent the occurrence of another attack, then fifteen to forty-five grains (1 to 3 gm.) should at once be administered hypodermically.

No quinine during attack

If the patient is seen for the first time during an attack, it is altogether useless to give quinine in the simple intermittent form of malaria.

Quinine treatment after the attack

If the patient is seen after the attack and if the seizure was very severe, and especially if the exact type of the malaria is not known, then fifteen to twenty grains (1 to 1½ gm.) of quinine should be given at once and the same dose repeated on the next day about five or six hours before the time of the expected paroxysm.

Atypic intermittent type

In atypic intermittent types of malaria and in the subcontinuous pernicious variety no definite rules can be formulated in regard to the exact time for administering the quinine. A safe rule is to give from ten to fifteen grains (0.6 to 1 gm.) of the drug by mouth every four or five hours for several days. It will often be found that the type of the disease then changes to the simple intermittent variety which should be treated as indicated above.

Pernicious type

If one is dealing with the pernicious type of malaria with severe apoplectic symptoms, or an overwhelming intoxication producing coma and tetanic convulsions, then quinine in doses of fifteen to thirty grains should be given at once and preferably by the intravenous method, this dose to be repeated every ten or twelve hours on several successive days.

Idiosyncrasy against quinine

There are some individuals unfortunately possessing a marked idiosyncrasy to quinine. They respond to the administration of even small doses of the drug with signs of cerebral congestion, disturbances of the senses of sight, smell and hearing, with nausea and vomiting, severe headache, dizziness, maniacal attacks and somnolency. While no case of death from quinine administered in therapeutic doses has ever been reported it, nevertheless, becomes necessary in such cases to reluctantly omit the use of the drug and to attempt the treatment of malarial paroxysms by some other means. Only in the pernicious type should quinine be administered notwithstanding the idiosyncrasy of the patient and the disagreeable reaction that follows its exhibition, for here the best and most rapidly-acting remedy must, by all means, be given in order to save the patient's life, and the personal sensations of the individual can therefore in no way be considered.

Remedies to replace quinine

Methylene blue

Chief among the remedies that can take the place of quinine is methylene blue in doses of two to four grains (0.1 to 0.2 gm.), by mouth; or hypodermically, in five per cent. solution in drachm doses. It colors the urine a greenish blue and occasionally produces strangury and slight gastro-intestinal irritation. The strangury can usually be counteracted by the addition of nux muschata to each capsule of methylene blue, a convenient formula being the following one:

℞
Methylene Blue,
Nutmeg, of each, 0.1 gm.
M.
S. Five to six such capsules daily.

Mode of action

Methylene blue probably acts like quinine by its lethal effect upon the plasmodium of malaria. In order to be effective it should be administered in the above dose several times a day for about ten days. It can hardly be said to take the place of quinine although it seems to be as effective as quinine in promoting the destruction especially of the crescent form of the malarial parasite.

Eucalyptus

Another remedy that sometimes acts beneficially in malaria is eucalyptus. This drug may be given either in the form of the fluid extract in one drachm doses several times a day or as the alcoholic tincture in doses of two to four teaspoonfuls, or as eucalyptol, in doses of ten to fifteen minims (0.6 to 1 gm.) in capsule, two or three times a day.

Antipyrin
Carbolic acid
Acetanilid
Phenacetin

Of other remedies like antipyrin, carbolic acid, acetanilid, phenacetin and many more that have at different times been recommended for the treatment of malaria, very little need be said. One is rarely called upon to consider other drugs than quinine, methylene blue and eucalyptus, and the efficacy of all the other series of remedies is, moreover, exceedingly doubtful.

Arsenic

Arsenic, however, has a very distinct place in the treatment of malaria. Arsenic possesses no lethal effect upon the plasmodium, hence it is of very little value in the treatment of acute cases. It is highly useful, however, in protracted, chronic, subacute forms of the disease, especially with malarial cachexia. If marked nervous disturbances develop in the course of malaria, arsenic is best administered in combination with quinine either in the form of arsenious acid, sodium arseniate or as Fowler's solution by mouth, as described in full on page 73, or, best of all, hypodermically, as the cacodylate of soda in half-grain to one grain doses, in watery solution, once or twice a day. There is no advantage in using quinine arseniate, in fact the administration of the two remedies separately allows easier regulation of the dose of each drug (see above).

Dose and administration

One of the most disagreeable and obstinate symptoms of chronic malarial intoxication is a persistent splenic tumor; and an important part of the after-treatment of malaria is the reduction of the size of the enlarged spleen. As a rule a continued course of quinine, or of eucalyptus, or of arsenic will bring about the desired result. If the splenic tumor persists despite the administration of these remedies, then the injection of quinine directly into the spleen, or even splenectomy, must be considered. The insertion of a hypodermic needle into the spleen is, however, a precarious procedure (see page 93).

Splenic tumor

Injections

From a series of clinical reports that have emanated particularly from Italian clinics, it seems that the insertion of the needle, itself, without regard to what substance may be injected, exercises the same effect that is occasionally observed when quinine or carbolic acid, or other remedies, are injected into the spleen substance. Hence the insertion of a sterile needle under aseptic precautions should answer the same purpose as the injection of any drug into the organ. This procedure, however, should be carried out under the most careful aseptic precautions and is best relegated to a surgeon.

Acupuncture

Faradization of the splenic region and the application of heat or cold rarely exercises more than a transitory influence; exposure to X-ray is always worthy of a trial (see page 93). With the reduction of the splenic tumor the cachexia frequently improves rapidly, hence every effort should be put forward to accomplish this result.

Faradization, Cold and Heat, X-ray

In order to prevent re-infection with malaria and, generally speaking, as a prophylactic measure to be adopted on entering malarial regions, the administration of five to ten grains of quinine, two or three times a day, is to be recommended.

To prevent malaria recurrences

The rôle of the mosquito and the means that must be adopted to prevent infection from this source are discussed in full in the Section on *Yellow Fever*.

Role of the mosquito

ACUTE ARTICULAR RHEUMATISM—(Rheumatic Fever).

Early administration of salicylates

At the onset of the disease with high fever, pain in one or several joint, often sore throat (tonsillitis) and the malaise, anorexia, furred tongue and other phenomena attributable to the high fever, the patients should be put to bed and the administration of salicylic acid or salicylate preparations begun at once.

Salicylic acid and its derivatives almost a specific

Salicylic acid and its derivatives must be considered almost a specific in most cases of the disease. Its exact mode of action is not known. It exercises an influence upon the nerve ends, chiefly in the joints, relieving the pain, and it may also probably possess some specific antibacterial and antitoxic action.

Large doses necessary

Proper dosage

In order to be effective large doses of the salicylic preparations must be given. It is futile to give five or ten grains, three times a day; in order to accomplish the desired result doses of from sixty to one hundred and twenty grains (4 to 8 gm.) should be administered in the course of twenty-four hours for several days in succession. The remedy should, therefore, be given continuously during at least the first three days in doses of ten to fifteen grains (0.6 to 1 gm.) every three or four hours, day and night.

Choice of preparation

The choice of the salicylic preparation is frequently difficult to make. Salicylic acid, itself, is said to act somewhat more quickly than any of the other preparations, but it is decidedly more irritating to the stomach than all its congeners. It should, above all things, never be given in solution, as it is soluble in water only in the proportion of one to five hundred, and as its solution in alcohol is so irritating as to preclude its internal administration in this form. If salicylic acid is to be given at all it should, therefore, be given in the doses mentioned above in capsules or powders, with milk.

Dosage in children

Salicylic acid

Sodium salicylate

Sodium salicylate may be employed either in solution or in powder or capsule in the same dose as salicylic acid; as its taste is rather disagreeable it is best, however, not administered in powder form. The most agreeable way of dispensing it is in a solution of peppermint water with simple syrup.

Children should receive smaller doses of salicylic acid, or of sodium salicylate, than those specified above. Children up to one year should not have more than fifteen grains (1 gm.) of either salicylic acid or sodium salicylate in the twenty-four hours; children from two to six should not receive more than thirty grains (2 gm.) in the twenty-four hours; and children up to twelve not more than forty-five or, at the most, sixty grains (3 to 4 gm.) each day.

Aspirin

The best preparation of salicylic acid, the one that is the least irritating to the stomach, bowel and kidneys, the one that hardly produces any of the toxic signs to be presently enumerated, even if given in very large doses, is aspirin. It may be given in thirty to forty-five grain doses (2 to 3 gm.) three or four times in the twenty-four hours; as its taste is not disagreeable it can be dispensed in powder form.

Poisoning from salicylates

Idiosyncrasy

In many cases of acute articular rheumatism in which large doses of salicylic acid, sodium salicylate or aspirin are given symptoms of poisoning appear within a short time, manifesting themselves by visual disturbances, congestion about the head, buzzing in the ears, dizziness, nausea, vomiting. In especially predisposed subjects having an idiosyncrasy against salicylic acid and its preparations, a single dose may produce violent symptoms of intoxication, headache, delirium, coma, retardation of the pulse, palpitation and drenching sweats.

Indications for stopping salicylates

Salol, saliphen, malakin, saligenin, salicin, oil of wintergreen

If these symptoms of intoxication appear one is often forced to stop the administration of salicylates and to give other remedies in their place. Occasionally only mild toxic symptoms will develop after the exhibition of one of the salicylic preparations. If the intoxication is not too severe it is always worth while to try to continue the salicylic therapy by using some other derivative of salicylic acid, as salol (not in nephritis), saliphen, malakin, saligenin, salicin or oil of wintergreen, especially the latter in doses of twenty drops every two or three hours in milk or in capsule.

Percutaneous administration

The exhibition of salicylates by the percutaneous method, i. e., by means of ointments rubbed into the skin, is also a very useful mode of administration and one that can to advantage be combined with the administration of salicylates by mouth. In cases in which symptoms of gastric irritation appear without any of the other signs of salicylic poisoning, the method of administering the drug by inunction alone is often efficacious. Here ointments made of one part of salicylic acid to ten parts of lanolin, or of equal parts of oil of wintergreen and lanolin, are especially serviceable.

Contra-indications to use of salicylates

Aside from the appearance of violent symptoms of intoxication in otherwise healthy subjects shortly after the exhibition of salicylic acid preparations, there are distinct contraindications to the use of these remedies, namely, cardiac disease, acute renal disease, congestion about the head and gastritis.

If the patient is unable to take salicylic acid or its derivatives in large doses, then it is futile to continue their administration in small doses, and recourse is better had either to certain other remedies to be now discussed or to local measures alone.

Remedies to replace salicylates
Lactophenin
Phenacetin
Antipyrin
Salipyrin
Potassium iodide
Guaiac
Colchicum

Remedies that can in a measure replace the salicylates are, above all, certain of the coal-tar preparations, chief among them lactophenin, which may be given in ten to fifteen grain (0.6 to 1 gm.) doses, every four hours; phenacetin in five to ten grain (0.3 to 0.6 gm.) doses; or antipyrin in five to fifteen grain (0.3 to 1 gm.) doses, three or four times a day. A very useful antipyrin preparation is salpyrin, a combination of salicylic acid and antipyrin, which is used in the same doses as antipyrin. Guaiac, potassium iodid, colchicum and many other remedies that have at different times been recommended, nowadays no longer occupy a place in the therapeutic armamentarium to be employed against rheumatic fever.

Alkalies

An energetic alkaline therapy instituted from the beginning of the disease and continued throughout its course, using alkalies either alone or in combination with salicylates, is always useful. The patient should receive from five to fifteen grains (0.3 to 1 gm.) of bicarbonate of soda in a tumblerful of water or milk, four or five times a day. As a beverage lemonade or orangeade answers a similar purpose, for the citrates contained in lemon or orange juice are promptly converted into carbonates in the body.

Local treatment
Rest of joints

Local treatment in acute articular rheumatism is of much less importance than in chronic forms of articular disease. The chief object is to make the patient comfortable and this can best be done by arranging the pillows in such a way that cramping and congestion of the affected joints are avoided, or by applying rests or supports according to the requirements of the case. It is rarely necessary, nor can it be considered good practice, to immobilize the affected joints, although, formerly, the adjustment of permanent splints, or even of casts, was in vogue.

Heat and cold

Some patients prefer hot applications, others are made more comfortable by the application of cold to the joints. Heat applied by the hot air bath is usually most soothing, and if the house is wired for electricity a box lined with several incandescent globes can be placed over the joint several times a day with great relief to the sufferer. The thermophore (see index), hot water bags, or poultices are often grateful.

Alcohol dressing
Alkaline washes

A very effective dressing is the application of absolute alcohol to the joints. A towel or several layers of gauze are soaked in absolute alcohol, applied to the affected joint and held in place by a loose bandage for eighteen to twenty-four hours. Simply wrapping the joint in cotton and bandaging loosely is of considerable benefit. Alkaline washes applied by means of cloths wrung out of a warm ten per cent. solution of soda and covered with flannel and renewed every few hours are useful. Salicylic ointment and oil of wintergreen ointment, as described above, can always be applied to the joint provided there is no idiosyncrasy against salicylic acid poisoning.

Salicylic ointment

Hydrotherapy

Aside from the application of wet, hot or cold cloths to the joints other hydrotherapeutic means are of very subordinate importance in this disorder. General baths, warm or cold, are of no benefit, may even do harm, and are, above all, very disagreeable to patients, because they are thereby forced to move about and deprived of their rest. Cleansing baths are, therefore, best given by sponging in bed.

Rest in bed

The element of rest is exceedingly important, especially in view of the frequent involvement of the heart. Any sudden exertion, getting up quickly, going to the toilet should, therefore, be forbidden. Upon the appearance of signs of endocardiac involvement an ice-bag should be intermittently applied to the precordial region and the other measures instituted that have been described in full in the Section of *Acute Endocarditis,* on page 49.

Ice bag to precordium

Room hygiene

The temperature of the room should be kept between 60 and 65 degrees and the patient carefully protected from drafts and cold, especially moist air. If the house is moist, then the driest and most sunny room should be selected for the patient with rheumatic fever. The patient should wear a flannel night-shirt and sleep between blankets that are not too heavy and yet warm enough. In many instances the pressure of the blanket upon the affected joint is exceedingly trying to the patient. In such cases a suitable support should be arranged of wire or wood to protect the joints from such pressure.

Clothing

Diet

The diet should, in the beginning and during the stage of fever, consist exclusively of milk. It can conveniently be given in the form of the milk-cream mixture described on page 27. Later when the appetite returns, the patient may receive other articles of food according to his tastes. While the importance of uric acid in the production of acute articular inflammations is very doubtful no harm can, nevertheless, be done by excluding from the bill of fare, during the acute stage of the disease, articles of food containing nucleins and articles containing extractives (purin bases), in other words all internal organs, young germinating plants, raw, rare, cured, smoked and corned meats, bouillons, meat extracts and gravies (see also Section on *Uric Acid Diathesis*).

Treatment of convalesence

It is very important that sufferers from acute articular rheumatism should not get up too soon as there is always a tendency

[illegible]

[illegible]

[illegible]

[illegible] may be considered a specific prophylactic [illegible] a few hours after the premonitory [illegible] have made their appearance the remedy is [illegible] It is very difficult to render an accurate [illegible] in regard to the curative value of tetanus antitoxin [illegible] of tetanus that run a protracted course [illegible] a considerable number of cases of [illegible] spontaneous recovery without the administration of the antitoxin. The great majority of tetanus [illegible] later stages of the [illegible] Notwithstanding this ambiguous [illegible] in regard to the efficacy of tetanus [illegible] tetanus the remedy should be [illegible] from its administration, and it is possible that here and there an isolated case may [illegible]

Mode of action

It appears that tetanus antitoxin possesses the power of neutralizing tetanus toxin while it is still circulating and before it has become permanently attached, so to say, to the ganglion cells of the central nervous system; when this attachment has occurred the remedy is apparently without effect. This postulate would explain the value of the remedy as a prophylactic and its modifying influence upon the course of the disease if administered within twenty-four to thirty hours after the first signs of irritation of the cerebro-spinal axis have made their appearance, and its inefficacy in most cases if administered later in the disease.

Indications for use of tetanus antitoxin

Tetanus antitoxin should, therefore, be used as a prophylactic measure in every case of trauma in which the wound is contaminated with dirt, especially manure, and particularly if dirt or manure particles have been carried deep into the tissues where they are deposited in a location that is protected from the air; for the tetanus bacterium leads an anaërobic existence and flourishes best in the absence of oxygen. For this reason punctured wounds produced, for instance, by stepping upon a rusty, dirty nail, and wounds produced by explosions which send dirt particles deep into the tissues, as in Fourth of July injuries, are especially liable to be followed by tetanus.

Place of injection

Tetanus antitoxin is best administered near the place of infection. If the injury is about the head, or in other regions of the body where it is difficult to inject large quantities of fluid under the skin, then at least a portion of the antitoxin should be injected near the seat of the injury and the rest in some other part of the body.

Administration hypodermically by lumbar puncture

The best method of administering tetanus antitoxin is by hypodermic injection. The administration by lumbar puncture is also very useful, provided it is carried out under aseptic precautions; for the antitoxin is more rapidly absorbed from the subarachnoid space than from the subcutaneous layers of the skin and, moreover, diffuses more rapidly through the cerebrospinal fluid than through the blood. Intra-cerebral injections possess no particular advantage over the injection into the spinal canal and constitute, moreover, a procedure of some magnitude that requires special surgical skill, whereas lumbar puncture is a simple procedure that any internist should be able to perform.

By the intracerebral method

Intravenous injections

The intravenous method of exhibiting tetanus antitoxin is not without danger and serious accidents have been reported from this practice. Moreover, it possesses no particular advantages over the subcutaneous method or administration by lumbar puncture, for the effect produced is only slightly more rapid.

Number of antitoxin units to be injected

At least one hundred antitoxin units, and not more than two hundred units, should be injected during the first twenty-four hours. (Behring.) Injections of one hundred units should be repeated on several successive days. An antitoxic unit is that amount of tetanus antitoxin that can neutralize ten units of tetanus toxin in the test tube; and a tetanus toxin unit (Gift Einheit) is the smallest quantity of tetanus toxin that can kill a guinea-pig, weighing about 250 gm., in three or four days.

Carbolic acid hypodermically

Bacelli and his school warmly recommend carbolic acid, administered hypodermically, as a prophylactic and a cure for tetanus. I have had no personal experience with this mode of treatment, but the reports emanating from Italian clinics are so positive and so favorable that the method may be mentioned.

Bacelli injects on the first day, either as a prophylactic or even after the tetanus spasms have set in, a two per cent. solution of carbolic acid in such amount that about three grains of carbolic acid are injected in the twenty-four hours. On successive days the amount of carbolic acid is increased to three or four times this quantity. It is claimed that tetanus cases show a great tolerance to carbolic acid and that the drug, administered in this way, exercises a beneficial effect upon the most distressing symptoms of the disorder and materially shortens the course of the disease, producing a cure in many cases.

Local treatment of the wound

The local treatment of the wound is of the greatest importance. The principles that should govern this treatment are to open the contused part by wide incisions so that free access of air may be favored even to the deeper regions. A careful search for dirt particles should be made, fistulous tracts should be explored and the whole area laid wide open. Various antiseptic dressings, carbolic acid, salicylic acid, bichloride, etc., may be used according to common surgical principles.

Irritants from external

General management

Aside from the specific treatment with antitoxin and the local surgical treatment, the general management of the case is of importance. Most patients with tetanus wear themselves out and die as much from the exhaustion produced by the spasms as from any specific lethal action of the tetanus poison; for this reason it is of paramount importance to preserve the patient's strength by reducing the number and the severity of the tetanic convulsions, while, at the same time, maintaining the nutrition of the patient to the maximum degree.

Rest, protected

An essential element in the treatment, therefore, is to protect the patient from all extraneous irritants—noises, light, contact with people and excitement of any kind—for in tetanus reflex irritability is enormously increased and the sufferers react with spasms or convulsions to stimuli that would normally not influence them at all.

A tetanus patient should, therefore, be put to bed in a dark room and should be left as much as possible to himself.

Hot baths

Hot bathing, two or three times a day, in water slightly above body temperature, is a very useful adjuvant to the treatment. The patients can, to advantage, be kept in warm water, half an hour at a time, two or three times a day. I have had the impression that this treatment reduces the number of spasms and is successful in shortening the convulsions, especially if the patients are placed into hot water immediately upon the onset of spasmodic symptoms.

The question of feeding is often a difficult matter, espe-

Diet and mode of feeding

cially if trismus is present. If there is much lockjaw, then the patient should be fed by rectum, as described in the Section on Gastric Ulcer, to be found on page 368, or, if necessary, through a nasal catheter. A patient with tetanus should receive large quantities of fluid, on the supposition that possibly the ingestion of much liquid will aid in diluting the circulating tetanus poison. Water should, therefore, be administered copiously by mouth and also by high enemata of warm physiological salt solution, frequently repeated. Immersion in hot water, coupled with free water drinking, unquestionably accelerates the lymph stream throughout the body and hence materially aids in keeping the toxin in circulation and possibly in preventing its attachment to the ganglion cells of the nervous system.

Morphine

Of remedies that can be given morphine occupies the first place and it is good practice to keep the patient more or less under the influence of morphine throughout the course of the disease. The exact dose can hardly be stated. The patient should receive enough to control the spasms, so far as that is possible, and keep him quiet.

Chloral hydrate

If morphine fails to control the spasms, then chloral hydrate, given in large doses of fifteen to twenty grains, four to six times a day, by mouth or by rectum, should be substituted. Very violent spasms occurring despite the administration of morphine or chloral hydrate, can usually be controlled by a few whiffs of chloroform. If the chest muscles are in a state of rigid tetanic contraction, then, of course, it is very difficult for the patient to inhale at all, so that here chloroform inhalations cannot be given. In such cases hot compresses to the chest often aid in relieving the spasm and enable the administration of chloroform.

Chloroform

Trional
Tetronal
Europhen
Thiosinamin
Cannabis indica
Antipyrin
Bromides

Trional, tetronal, europhen, all given in doses of ten to thirty grains (0.6 to 2 gm.), three or four times a day are often efficacious. Tincture of thiosinamin, five to twenty drops (0.3 to 1.2 cc.); or the extract of cannabis indica one-eighth to one-fourth grain (0.08 to 0.06 gm.) or the fluid extract, two to five drops (0.1 to 0.3 cc.); antipyrin in five to fifteen grain (0.4 to 1 gm.) doses, repeated several times a day; bromide of sodium or potassium, finally, given alone or in combination with chloral hydrate, by rectum, in large doses of twenty to thirty grains (1.3 to 2 gm.) are the drugs that all merit trial and occasionally aid in controlling the most distressing symptoms.

DYSENTERY.

Definition

Classification

The term dysentery is employed to designate a number of disorders of different etiology that are all characterized by colic, tenesmus and the evacuation of small stools at frequent intervals, containing mucus and blood. One can distinguish between an epidemic and an endemic variety. In addition there are sporadic cases which are presumably isolated instances of the endemic variety.

Catarrhal dysentery

Tropical amebic dysentery

Epidemic dysentery is also known by the name of catarrhal dysentery and occurs chiefly when general hygienic conditions are very bad. Its course is milder and its mortality lower than in the endemic form. It is produced by different bacilli that are presumably introduced into the body through the drinking water. In the endemic variety, also known as tropical dysentery, certain ameba must be incriminated with causing the disease. Here the submucous layers of the intestine are usually affected, whereas in the catarrhal variety the surfaces of the mucosa show the first changes.

Symptomatic dysentery

In addition there are a number of forms of symptomatic dysentery that are produced by mechanical causes and that are due to a variety of intoxications.

No specific treatment

The treatment of all forms of dysentery is essentially the same and largely symptomatic, for we possess no specific treatment in the parasitic varieties.

Diet

The diet should be non-irritating to the bowel and should leave a small residue. In the acute forms and until the severe colic, tenesmus, frequent diarrheas and the fever stop, the diet should be largely liquid and consist of milk preferably diluted with lime water, or strained gruels, or meat broths and soups. A very useful food is albumen water made by shaking the whites of twenty eggs in a pint or two of water, adding some sugar of milk and some flavoring extract. This quantity should be taken in divided doses in the course of twenty-four hours. In addition, the patients may have abundant water or lemonade or dilute wine.

As soon as the acute symptoms subside a semi-solid diet may be permitted. A solid diet, however, should not be given until all blood and mucus have disappeared from the feces, and the diarrhea, the colic and tenesmus have been altogether relieved. The diet, in other words, does not differ materially from that advised in typhoid fever or in any other form of acute intestinal catarrh.

Calomel

Of medicaments that should be administered by mouth, calomel, given in small (one-fourth grain) doses throughout the disease is the sovereign remedy. It acts beneficially both on account of its laxative and its antiseptic properties. Vegetable laxatives should not be given in this disease as they are apt to be too irritating. Small doses of castor oil or of olive oil can do no harm. If there is much constipation, especially in the beginning, a brisk saline laxative is indicated.

Laxatives

Ipecac

Very popular, especially in the tropical variety of dysentery, is ipecac. In the different countries it is given in different ways. The most sensible and least harmful method of administering it is the one recommended by English physicians in the British colonies; viz: The patient is first given a hypodermic of one-fourth grain of morphine, hot turpentine stupes are then applied to the abdomen and an hour after the administration of the morphine, one grain of the root of ipecac in capsule is given, followed by copious draughts of water. This dose is repeated two or three times in one or two hour intervals. In this way large quantities of ipecac can be introduced without producing distressing retching and vomiting.

Astringents

In the acute form astringents may be given, chief among them tannin. It is best given in the form of tannalbin, in doses of thirty to fifty grains a day in divided doses of ten grains each. Naphthalin, preferably in combination with calomel, acts very beneficially both upon the colic and tenesmus and the character of the stools. Kartulis recommends the following prescription:

℞

Naphthalin,	1.0 gm.
Calomel,	0.5 gm.

M.: Make ten such powders.
S.—One powder every two hours.

In addition to these remedies narcotics, opium and preferably morphine, hypodermically, may have to be given as palliatives to relieve particularly distressing symptoms.

Rectal medication

The rectal administration of medicines is especially useful in this disease, because in this way the seat of the trouble can be best reached. For very violent tenesmus small laudanum-starch enemata should be given.

℞

Laudanum,	10 drops
Starch,	1 tablespoonful
Lukewarm water,	200 cc.

Or

℞

Cocaine,	1 gm.
Water,	250 cc.

For severe hemorrhage and colic, sulphate of soda is useful

℞

Sodium sulphate,	10 g.
Water,	250 cc.

Or a dilute solution of iron perchloride, or ice water alone, injected in small quantities into the rectum are all effective.

Enteroclysis

More valuable than the use of enemata is treatment by enteroclysis, for it promotes cleanliness of the lower intestine and, at the same time, enables the application of healing remedies directly to the affected lining membrane of the bowel. The ordinary antiseptics like carbolic acid, corrosive sublimate or the salicylates are too irritating. The same applies to silver nitrate whose astringent properties might otherwise be employed to the advantage of the patient. Other antiseptic remedies are insoluble in water and can consequently not be utilized (iodoform, naphthalin, etc.). The chief remedies that can be employed advantageously are tannin and quinine, the former to be used in half per cent. solution, the latter in warm solutions of the strength of 1 to 1000 to 1 to 5000. From two to three litres of fluid should be used two or three times a day. The irrigating bag should not be elevated very high, as otherwise too great pressure may be exercised upon the bowel wall and perforation occur.

Chronic dysentery

In chronic dysentery practically the same remedies are useful. Here again warm quinine solutions or solutions of tannin are very helpful. Internally, tannalbin, calomel and naphthalin are the chief remedies.

INFLUENZA.

Treatment exclusively symptomatic

The treatment of influenza, owing to the fact that we possess no specific remedy, is exclusively symptomatic. Upon the onset of the first symptoms, energetic diaphoresis should be stimulated by hot baths, hot drinks, quinine, Dover's powder, as described in the Section on *Acute Bronchitis.* An influenza patient, however mild the onset of the symptoms, should be placed to bed and kept there until the temperature is normal. The diet should be bland and non-irritating, in other words, should consist of the ordinary fever diet (see page 509).

Antineuralgics

Of remedies the ordinary antineuralgics are the most useful, for they make the patients more comfortable, reduce the severity of all the symptoms and, above all, stop the distressing headache, backache and restlessness. It is always well to inaugurate the treatment with a full dose of calomel, followed by a saline laxative. The most useful remedy in my hands has been aspirin in combination with quinine, of each five grains, to be given every five hours for three or four days. Salipyrin and antipyrin are less safe on account of their effect upon the heart. Alcohol is always useful. A little whisky and water given throughout the course of the disease aids materially in counteracting the heart weakness and symptoms of nervous depression that so commonly supervene in influenza.

Aspirin

Alcohol

Hydrotherapeutic means are of subordinate importance in the treatment of this disorder, owing to the comparatively short duration of the disease. There is no harm in using the above antipyretic drugs and no advantage is to be gained from attempting a reduction of the fever by the more complicated hydrotherapeutic measures. Symptomatically, hot bathing, in fact, is always more useful than cold hydrotherapeutic means and a hot bath given once or twice a day, with an ice bag or cold cloths to the head, is often helpful.

Hydrotherapy

The treatment of the complications is synonymous with the treatment of the organs affected and will be found discussed in the chapters on *Digestive, Respiratory and Cardiovascular Disorders.*

PERTUSSIS.

(By Dr. Frank Spooner Churchill, Chicago.)

Two principles may be laid down in the management of whooping-cough, viz., take every precaution possible to prevent infants and children from contracting the disease; when once contracted, treat the individual, not the infection.

Principles

Much can be done, in private practice especially, to guard infants and young children against contracting pertussis. The popular idea that this disease is a trifling affair, that "they have all got to have it and the sooner they have it the better," is fortunately disappearing. Intelligent mothers now try in every way to prevent their children from contracting the disease. They guard them rigidly, and properly so, from exposure in this direction. Infants and young children should not be allowed to play either indoors or outdoors with others who have whooping-cough. Weak, debilitated children, especially those with a tendency to respiratory troubles, tubercular or non-tubercular, should not be allowed to attend kindergarten or any public gathering of children, both because the time thus spent indoors ought to be spent outdoors, and because there is great risk of contracting all contagious diseases at such gatherings. Nor should they be allowed to play with children who have in any way been exposed

Prophylaxis

to whooping-cough but have not yet manifested any signs of the disease themselves. The latter may be in the incubative stage of the infection and therefore capable of spreading it.

Lymphocytosis

All children with a suspicious cough, except those who have already had pertussis, should be excluded from contact with other children. The early diagnosis of whooping-cough is often a difficult matter and until one is sure that a hard cough is not a manifestation of this infection, a child with such a cough should be withdrawn from association with other children. A high percentage of lymphocytes is strong confirmatory evidence of the disease and justifies isolation, temporary at least; for it has been shown* that in over ninety per cent. of cases of pertussis there is a marked lymphocytosis, even in the catarrhal stage before the development of characteristic symptoms, and that this lymphocytosis rarely if every occurs in other respiratory affections accompanied with a hard cough.

We cannot emphasize too strongly the importance of these rigid precautions, especially for infants and young, weakly children among whom the disease is most severe and so often fatal. They should be guarded against it, at least until they are older when it will be a much less serious affair for them. It is of course impossible to observe this great care in the congested districts of our large cities, but even here more care can be exercised than is generally done. The practice of directing patients with whooping-cough to "return" to the clinic cannot be too strongly condemned. It is wrong to the other patients, it has a bad moral effect upon the students, confirming them in their lay idea that the disease is a trifling affair. The physician who practises this custom is criminally negligent.

General hygiene and diet

It must be remembered that pertussis is a self-limited disease, runs a certain course and that we have no means of cutting it short. Obviously then, the indications are to keep the individual in the best possible fighting trim that he may have the strength to outlast the whooping-cough organism and to sustain the attack with as little damage to himself as possible. This is best done by careful attention to his general hygiene and diet. Medication is a matter of secondary importance.

The patient should have an abundance of fresh air; he should be out-doors as much as possible in the daytime and at night should sleep in a well-aired, well-ventilated room.. He may sleep out-of-doors during the spring, summer and autumn months in the north temperate zone. In dealing with infants and young,

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*Churchill. *Journal A. M. A.*, 1906, XLVI., 1506.

debilitated children, however, care and judgment must be used in exposing them to the severe winter weather of a northern climate. Large, well-ventilated, well-lighted rooms, one for the day and one for the night, are undoubtedly better for some of these patients than the indiscriminate application of the "fresh-air" treatment. Individual peculiarities must be heeded and the patient treated accordingly. Those children who live in the congested districts of cities, and for whom fresh air, indoors or outdoors, is an impossibility, should be sent to a hospital and later to a convalescent home or camp in the country.

Climate

A change of locality, as from sea-shore inland or vice-versa, is often of benefit, especially where the cough is unduly prolonged. The Atlantic seaboard from Cape Cod south is especially desirable for such patients. The balmy air and comparatively warm sea bathing have a most beneficial effect upon them. Those who cannot have this change of environment will be much benefited by long hours spent in the parks, at the lake or river front where these localities are clean.

Nourishment

Next in importance to fresh air for older children, and equally important with it for infants, is the question of nourishment. Those infants fortunate enough to be at the breast should be kept there. Those not at the breast should have their diet carefully regulated and be put on cow's milk modified to the needs and capacity of the individual infant. It is among this class of patients that whooping-cough is so serious and so often fatal, as has already been said. The disease wears out the baby either by itself or by the development of pneumonia or some other complication. Hence the maintenance of his nutrition is vital.

Character of the diet

The diet for older children should be largely liquid and easily digested. Meals are necessarily irregular; the child is so apt to lose a whole meal by a paroxysm coming on soon after eating that he must be fed again in a short time. He should remain quiet for at least an hour after the hearty meals of the day. Paroxysms are apt to come on at evening soon after the child falls asleep, possibly due to the recumbent position; hence it is advisable either to give the evening meal earlier or to put him to bed later that digestion may be further advanced before the paroxysm comes on.

Laxatives

The bowels should of course be kept freely open. Where this cannot be done by a diet rich in fruits and vegetables, laxatives must be used. The fluid extract of cascara sagrada (aromatic) is excellent for this purpose; it may be given in doses of ten to thirty drops one to three times a day, according to results. Phosphate of soda in drachm doses may be given every morning.

A thorough clearing out of the intestinal canal once or twice a week is often of benefit; for this purpose one grain of calomel in one dose, or a drachm of castor oil may be given in the morning.

Stimulants and tonics

Stimulants must be used in some cases even when no complications are present. Brandy is the best form of alcohol to give as it is less likely to upset the stomach than whisky. Strychnine in doses of one-one-hundredth of a grain may be given to older children. Iron and cod-liver oil are often indicated in the later stages with considerable debility and anemia.

THE TREATMENT OF THE PAROXYSM.

The paroxysm

There is little to be done when the paroxysm of whooping-cough is actually on in older children. Young infants, however, should never be left alone during the paroxysmal stage on account of the danger of strangulation. They must be taken up during an attack, held face downward and often it is necessary to clear out the mucus from the throat with the finger. A severe paroxysm which threatens suffocation may be relieved by inhaling oxygen or ether. Intubation has even been done for such. Chloroform should not be used on account of the possibly weak condition of the heart so frequently present in whooping-cough.

Medication

Medication is of far less importance than the details of general treatment insisted upon above. A few drugs, however, do seem to diminish the number or severity of the paroxysms and these should be tried. They may be given (a) internally, (b) by inhalation, (c) by insufflation.

(a) Internally. All the drugs in the pharmacopœia have apparently been recommended for the treatment of pertussis, but of them all only a few have stood the test of time and experience. These are belladonna, quinine, phenacetine, antipyrine and bromoform. It is better to delay the use of drugs until the paroxysmal stage is well under way; one preparation at a time should be given a thorough trial; if benefit seem to come from its use continue it, if not, stop and try another. Some cases are so mild throughout that no medicine at all is necessary.

Belladonna

The effects of this drug must be carefully watched. It should be given at first in small doses, one-fourth minim of the fluid extract to an infant eighteen or twenty months old, every four hours, gradually increasing to one-fourth minim every two hours. Atropine also may be given in the same way, beginning with about one-eight-hundredth grain. Undoubted benefit seems to follow the proper use of these preparations in most cases, but they must be pushed to the limit, until the flushed face and dilated pupils are noticed. The best results are seen in hospital cases which are under constant supervision.

Quinine

This may be given to older children. It should never be given to infants. It must be administered in large doses, ten to fifteen grains daily to a child five or six years old. If it disturbs digestion it must be stopped.

Phenacetine and antipyrine

These preparations allay the severity and frequency of attacks in many instances. They are particularly valuable where much sleep is being lost and the child is in an irritable and fretful condition. They should be given always with a stimulant, brandy, whisky, coffee, caffein, etc. They may be given in fairly large doses; one grain every two to four hours to a six months old infant. To an infant eighteen to twenty months old, two grains every two hours may be given. For older children larger doses in proportion to the age are prescribed. It is recommended by some to combine the bromide of sodium with these coal-tar products. I have had no personal experience with this method

Bromoform

This is one of the more recent preparations. It seems to be of value in some cases. It is given in doses of one to three drops every two or three hours to an infant two years old, and three to five drops every two hours to a five-year-old child. All preparations must be shaken before using and it may be given on a lump of sugar.

I have found phenacetine the most satisfactory of the above drugs. It has been prescribed always with a stimulant, brandy to weak, debilitated or exhausted children, caffein (one quarter grain) and sugar of milk (ten grains) to others.

Cresolene

(b) Inhalation. The administration of drugs by this method and by insufflation is based on the theory of the local nature of pertussis and aims to allay the irritability of the respiratory mucous membrane. Inhalation is more effective than insufflation. The preparations most commonly used are creosote, cresolene and carbolic acid. Cresolene is especially valuable. It is used generally at night and may be evaporated on a special lamp or an ordinary croup kettle may be used. The windows of the bedroom may or may not be kept open, according to the effects produced. The possibility of poisoning from these drugs must be remembered and the urine watched.

(c) Insufflation. But little has been accomplished by this method and it is seldom used at present. Quinine is most commonly used, mixed with some bland powder (1:10), such as bicarbonate of soda, acacia, talcum or coffee. Antipyrine has also been used in this way.

The local application of cocaine to the larynx is dangerous and should not be done.

Stage of decline

The management of the stage of decline in pertussis requires but brief mention. The diet can now be increased, more solid food being given. Life in the open air should be continued. The change of environment in prolonged cases has already been mentioned. But isolation should be continued for at least four weeks after the cessation of the paroxysms. The possibility of the development of tuberculosis at this time must be borne in mind.

Complications

The most serious complication of pertussis is broncho-pneumonia. Its management is the same as that of pneumonia from other causes, being mainly supportive and stimulating. Rest in bed, an abundance of fresh air, baths, warm or cold, according to the child's temperature, his vigor and general condition: as nutritious a diet as possible and stimulants are the main principles to be laid down. Stimulants must be used freely; brandy and strychnine are the favorite ones; carbonate of ammonia and nitro-gycerine are also used. Inhalations of steam, plain or medicated with creosote, are of great help and should be freely used.

While pneumonia is the most frequent complication during the winter months, gastro-intestinal trouble is of frequent occurrence in infants during the summer weather, and is a serious matter. Proper feeding from the outset will do much to prevent its development. Once established its management is that usually adopted under such conditions: emptying and disinfecting the digestive tract, modification of the diet, etc. If vomiting is very persistent we have to resort to rectal feeding to keep up the patient's nutrition.

Convulsions, severe hemorrhages, albuminuria, etc., are to be treated according to general principles.

PAROTITIS.

(By Dr. Frank Spooner Churchill, Chicago.)

Hygiene

Mumps is generally a mild disease, and but little active treatment is required. The patient should stay in the house, except during warm weather, until the acute symptoms have subsided. In the more severe cases, however, accompanied with high temperature and general constitutional disturbance, more energetic measures must be taken. He should then, of course, be kept in

Hydrotherapy

bed, the bowels kept freely open, baths as in pneumonia or typhoid may even be necessary in especially severe cases, and

Drugs

Diet

antipyretics may also be used. Phenacetine, prescribed as in pertussis, relieves the pain and general discomfort. Sweet spirits of nitre is also of value. Hot applications to the swollen and tender glands are often acceptable. A mouth-wash should be freely used, and for this purpose listerine is an excellent preparation. The diet must be liquid on account of the pain in swallowing.

Complications

Complications are rare in early childhood. Later, especially in early youth, the most serious complication is an orchitis. If present the patient must be kept rigidly in bed, the gland being supported and hot or cold applications made. He should be kept in bed until the acute symptoms have subsided and on getting up a suspensory bandage should be worn for several weeks.

Otitis and nephritis occur but rarely. They should be treated on general principles. As in all infections, the urine should be examined both during and after the acute stage of the disease.

Suppuration of the parotid rarely occurs, but if it develop it should be treated on surgical principles.

Children with mumps should be excluded from school and quarantined for three weeks from the beginning of symptoms.

SCARLET FEVER.

(By Dr. Wm. L. Baum, Chicago.)

Prophylaxis

In view of the high mortality during early life and the decreasing susceptibility and danger with advancing years prophylaxis becomes a most important factor. Unfortunately, during the incubation period, the contagion may be spread. This is especially true when a case appears in a family or in a school. The case should be isolated at once and the rooms frequented by the patient thoroughly disinfected.

The room occupied by a patient can be disinfected by means of formaldehyde, although this method is not so satisfactory and thorough as is the washing of the walls and furniture with a 1-2000 bichloride of mercury solution, and the boiling of the bed linen, clothing, etc. In hospitals, the formaldehyde disinfection is not so satisfactory. At the Cook County Contagious Hospital, where this method has been most thoroughly tried, cases of scarlet fever have been known to develop in a room subsequently occupied by patients suffering from other diseases. This was not the case where the bichloride washings were employed. It is needless to say that the attendants should be isolated and exercise the greatest precautions in their relations to the family and others to prevent the spread of the disease.

Isolation

Patients should not be allowed to leave the room until free from contagion and until desquamation be complete. Isolation should average at least six weeks. The minimum period of exclusion from school should be seven weeks. During the week preceding the discharge, the patient should have at least two baths in a solution of sublimate of the strength of 1-5000. The clothing should be disinfected with steam or by boiling. This is particularly true of clothing worn by the patient at the beginning of the attack. In one case isolation was carried out for eight weeks and it was thought every precaution had been taken. Four weeks after the patient's discharge his little brother was sent to the hospital. Five days previously the elder brother had, for the first time since discharge, worn the suit of clothes which he wore when first attacked, which clothes were the only articles that had escaped disinfection.

Despite the claims made by certain authors and the antique use of belladonna, iodide of mercury and oil of eucalyptus as a prophylactic, there is no evidence that any medicinal agent will prevent infection.

The patient should be placed in a room from which superfluous furniture, such as carpets, pictures, etc., has been removed. The room should be kept at about 60° F. and well ventilated. There is no danger from air currents in the room. Bed coverings should be light.

Mouth disinfection

Care of the mouth, throat and nose is of the greatest importance, since Hektoen has shown that streptococci enter through the tonsils. For this purpose sodium salicylate in 0.5 to 1.5 solution may be given in teaspoonful doses every two hours for the first four or five days, as suggested by Forchheimer. For a mouth wash a solution of boric acid, or one of potassium permanganate 1-500 can be used.

Sera

Much interest has lately been aroused by the employment of antistreptococcic serum. Its value must depend upon the assumption that the streptococcus is either the etiological factor, or that its presence is the cause of the toxic disturbances for whose control an antibody is necessary. Various serums have been employed. Marmorek's serum, which I have employed in the treatment of seventy-one cases, did not reduce the mortality or lessen the complications to any appreciable extent. Baginsky, whose early experience was of a similar character, later used the serum prepared by Aronson, reporting a series of sixty-two cases with a mortality of 11.3 per cent., while sixty-three cases treated without the serum showed a mortality of 17.3 per cent. Escherich, of Vienna, uses a serum which differs from that of Aronson and Marmorek in that the streptococci in immunizing the horse were taken directly from man and without raising their virulence by passage through the lower animals. The animals were immunized by cocci from many instead of a single source. The dose of this serum varies from 100 to 200 cc. In Escherich's report of 112 cases treated with this serum, he claims that in from four to twelve hours the temperature dropped; the pulse and respiration slowed down; the stupor and delirium disappeared; the general condition improved and the eruption faded. The serum causes transient exanthemas in about 75 per cent. of the cases. Since the use of the serum ulceration of the throat and suppuration of the glands have been less frequent. One striking feature of Escherich's report is the following: Of 27 cases injected within the first forty-eight hours of the disease, none died; 2 of 27 injected on the third day died, and 6 of 20 injected on the fifth day; a mortality ranging from nothing during the first and second day, through 7.4 per cent. the third; 17.4 per cent. on the fourth to 30 per cent. on the fifth day, a result striking in similarity to that following the use of antitoxin.* Owing to the difference in virulence of the various epidemics, and even of periods of the same epidemic, it is difficult to draw satisfactory conclusions as to the value of these methods of treatment.

In my own service at the Cook County Hospital, comprising the period from February, 1895, to April, 1906, there were treated 1672 cases with 125 deaths, or a mortality of 7.49 per cent., showing that the disease did not occur in a very virulent form during these years. A change in the epidemic was noted in December, 1905; in the following four months there were 265 cases with a mortality of 13.6 per cent.

Diet

Diet should, for the most part, be light, consisting chiefly of milk. The large quantity of water contained in it is of great value in these cases, especially toward the end of the third week, if there be no nephritis or other contra-indications. Diet can be gradually increased in quantity and variety. In the fifteen years elapsing since Jaccoud employed milk as a diet, he has not had a case of nephritis after scarlet fever. My own experience has not been quite as favorable.

Elimination

The early treatment should be directed towards securing free elimination by way of the bowels and kidneys. This, when successfully accomplished, will in a large measure prevent the grave cardiac and renal disturbances.

In many cases within a few hours from the first eruption, or even before its appearance, delirium or unconsciousness develop,

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*Zanghofer, v. Bokay and Quest report a similar experience following the use of the Moser, also a polyvalent serum.

Fulminant type

accompanied by suppressed or scanty urine. The urine is loaded with albumin, some casts and occasionally blood. These fulminant cases should be treated by venesection and transfusion with normal salt solution. Water should be given from the onset in large quantities and diuretics employed. The best and safest is an infusion of birch leaves, 30 to 1000 cc. given in two tablespoonful doses every hour. This causes neither heart depression nor nausea, and usually results in a rapid increase in the kidney elimination.

Baths

The fever should be combated by means of the cold bath or sponging with cold water (antipyretics should never be employed). The reasons for the use of baths may be best stated in the words of von Jürgensen: "The difference between the temperature of the body surface and the water that comes in contact with it are the determining factors. At the very moment that cold water comes in contact with the skin, deep respirations ensue, which not only cause a complete distention of the lungs, but must have a considerable influence upon the circulation.

"The heart, which during the superficial breathing is working under difficulties, is now relieved of the burden to a considerable degree, and receives more and a better quality of blood. Owing to this, its vitality and functional power increase. If the temperature of the body is increased, the number of the heartbeats decreases with the cooling caused by the radiation of heat to the water surrounding the body. The intervals between the single beats become longer, the diastolic storing away of the blood in the heart becomes greater, and the heart in this way becomes qualified for better work. At this point begins a more rapid and copious circulation throughout the entire system, and with it the possibility of throwing off the toxin."

The cold baths should last but a few minutes and the water should be at a temperature of about 65° F. Where the cerebral symptoms are marked the ice pack can be applied to the head and cold douches can be given to the back of the neck, and at intervals along the spinal cord. If the skin is cold and the temperature high it denotes marked cardiac weakness and warm baths should be given. The contra-indications to the use of cold baths are cardiac weakness, organic disease of the heart, dyspnea due to stenosis of the upper air passages, hemorrhages from the nose, mouth, or a hemorrhagic diathesis; also when joint inflammations are present.

Urotropin

Widowitz reports 102 cases in which urotropin was employed without a single case of nephritis; others have used it, some with similar results and some claiming that it has no effect. The dose varies with the age of the patient and is given three or four days in the beginning of the attack, and for three days at the beginning of the third week.

Nephritis

When nephritis develops the bowels should be kept free by the administration of repeated doses of magnesium sulphate, and the infusion of birch leaves given in large quantities, or the mixture of iron and ammonium acetate. The latter seems to do well in those cases where the nephritis is associated with anemia. When uremic symptoms develop very hot baths at a temperature of 110° F. should be employed.

In cardiac weakness camphorated oil given hypodermically is probably the best stimulant. Infusion of digitalis with strychnin can also be employed.

The nose and throat

The early infection of the nose in the case of very young children should be treated by dropping a few drops of a solution of sodium bicarbonate, 1 to 200, into the nostrils; older individuals employing it in the form of a douche. After each douche a little sterilized vaseline should be applied to the nostril. The severe angina if pseudo-membranous is usually due to the presence of the Klebs-Loeffler bacillus and 5000 units of antitoxin should be administered at once. Painful angina is much relieved by allowing the patient to swallow small pieces of ice and applying the ice pack about the throat. Enlarged and suppurating cervical glands should be incised when there is fluctuation, or earlier when the tension becomes too great. The Credè ointment has proven useless in the treatment of the enlarged glands. The ears should be examined frequently as an otitis media due to extension of the inflammation from the throat through the Eustachian tube is a quite common complication. Should an otitis develop, paracentesis should be done at once and the ear irrigated every two hours with a hot boric acid solution until the discharge ceases. Mastoid infections are extremely rare when this method of treatment is followed.

Otitis

MEASLES.

(By Dr. W. L. Baum, Chicago.)

Prevention

The almost universal susceptibility to measles and the fact that sooner or later almost every individual will be attacked give rise to the interesting question whether it be better to guard the public against this infection or allow general exposure in the hope that for a generation at least the disease will disappear? No one who has witnessed the ravages of a virulent epidemic with high mortality and severe complications, and their far-reaching influence upon the future of the patients, can for a moment question the advisability of protecting the public as much as possible, both by compulsory isolation of the individual attacked and such regulations as tend to limit the spread of the disease. Unfortunately the period of incubation, especially during the catarrhal stage, is capable of spreading the contagion. During prevalence of measles in a certain district public school teachers should be instructed to send home all children suffering from conjunctivitis or coryza, with instructions that they be examined by a physician. The finding of Koplik spots and the subsequent isolation of the patient may limit the spread of the disease. Disinfection of rooms and clothing, as employed in diphtheria and scarlet fever epidemics, will protect the community.

The sick room

The patient with an attack of measles should be placed in a well aired room kept at a temperature of 65° F. The air of the room should be kept moist because of the universal involvement of the mucous membranes. Dry air increases irritability of the bronchial tubes and predisposes to the most dreaded of all measles complications—broncho-pneumonia. The room should be partially darkened to protect the eyes; once a day the light should be freely admitted to make a careful examination of the conjunctiva and cornea. As a rule the eyes need no further care, but where there is much irritation an ointment of the yellow oxide of mercury, 1-100, can be applied to the lids.

The nose and throat

The nose should be treated by dropping a small quantity of a solution of sodium bicarbonate, 1-200, into each nostril and the subsequent application of vaseline or oxide of zinc ointment. The throat and mouth should be washed out with a mild antiseptic solution—boric acid solution, 1-100, or postassium permanganate, 1-500. Laryngeal spasm should be controlled by the administration of a small quantity of Dover's powder suitable to the age of the patient. In severe cases warm baths are indicated. When the stenosis is due to swelling of the mucous membrane or to the formation of a plug of mucus in the trachea and larynx, an emetic should be given at once; apomorphin given subcutaneously acts most promptly. If these do not give relief, intubation or tracheotomy should be employed.

Fever

For the fever antipyretic drugs should not be employed. Baths at a temperature of 85° F., or sponging, will reduce temperature. If there be much nervous irritability small doses of potassium bromide can be given in conjunction with aconite.

Broncho-pneumonia

Measles patients who develop broncho-pneumonia, that most dreaded of all complications, should be at once isolated from other cases of the disease. A cold pack may be applied, but with small children care should be taken that they do not become chilled. This tendency can be overcome by application of heat and friction to the extremities. The heart may be stimulated by the hypodermic use of camphorated oil.

Diarrhea

Where diarrhea is a feature of the eruptive stage treatment therefor is as a rule not necessary. Should it persist, small, frequently repeated doses of bismuth subgallate, with enemas of normal salt solution every four hours, will usually relieve the condition.

Extension of inflammation from the throat may lead to a suppurative otitis media. This if not relieved, leads to infection of the mastoid, necessitating operative interference.

Weiss claims that by placing pledgets moistened with weak silver solution in the nostrils and carrying them backward by pressure, he has reduced the percentage of otitis in measles from 27 to 7 per cent. Should suppurative otitis develop, the drum should be incised and irrigations of hot boric acid, 1-100, or protargol, 1-300, every three hours should be employed and kept up until the discharge disappears.

Diet

During the eruptive period the diet should consist of milk, eggs, and foods easily assimilated; later this may be increased to the full, regular diet during the period of convalescence.

The patient with uncomplicated measles should be isolated for at least twenty-eight days; cases with persistent discharge from the nose or ears, for a longer time.

SMALLPOX.

(By Dr. Heman Spalding, Chicago.)

Classification of preventive means

The treatment of variola should begin with a consideration of the proper application of known preventive measures. Measures commonly employed and known to be efficacious in preventing smallpox are:

1. Notification of cases and suspected cases of smallpox to Boards of Health or Health Officers.
2. Quarantine and Isolation.
3. Disinfection of infected persons and premises.
4. Vaccination.

NOTIFICATION.

Reports to health officers

That prompt preventive measures may be taken by the rightfully constituted health authorities or health officers in states, cities and towns, there should be state laws and city ordinances enacted, requiring, under penalty, a prompt report to the health officer of all infectious diseases. Cities have health ordinances and health officers to whom reports can be made. Some towns and villages are not thus provided, and when they are not, reports should be made to the county health officer or the state board of health. Physicians should promptly report any suspected case of variola. Owing to the lack of opportunity to see variola, the ablest of practitioners are liable to find it difficult to make an early diagnosis of this disease. Any eruptive disease not certainly understood should be promptly reported to the health officer as suspicious, throwing the responsibility of making a diagnosis upon that officer, who is, or should be, especially qualified for this work. It is the health officer's duty to see that the physician who reports a suspected case of smallpox suffers no loss of confidence from the patient or his friends. The protection of the physician's interests is easily accomplished if the health officer is tactful and ethical, as he always should be.

Early diagnosis

QUARANTINE AND ISOLATION.

Guards

If the victim of smallpox is to be treated at his home, as is the practice in small towns and the country, a strict quarantine of the house must be maintained. As no quarantine is effective if not complete, guards for the house must be stationed day and night, and no one except the attending physician or health officer allowed to enter or leave the infected house.

Personal care of physician

The doctor should have a robe or a long rubber coat hanging outside the house to put on while visiting the patient, to be again removed upon coming out. He should then wash face, hands and hair in a 1 to 500 bichloride of mercury solution and sponge off his clothes and soles of his shoes with the same solution. While in the house visiting the patient, the doctor should avoid, when possible, touching anything except the floor with the soles of his shoes. If there is no contact with anything infected, there is little liability of carrying infection to others.

Home disinfection

To quarantine smallpox in the house is expensive and less efficient in checking the spread of the disease than is the practice of taking all patients to an isolation hospital. In the latter practice the patient is at once taken to the hospital in a carriage or ambulance. Those suffering with the mild form of the disease, and even some of the severer cases, when found on the first day of the eruption, prefer to go in a carriage. At this period of the disease they usually are able to sit up and walk. All persons exposed to the case are vaccinated and the persons and premises disinfected with formaline and a free use of bichloride of mercury solution, 1 part to 500 of water. If the victim of the disease has remained home through the pustular stage of the disease, it is safer to burn the mattress and all bed covers used which cannot be immersed in the bichloride solution and boiled. Nothing should be taken from the infected house, even to be burned, that has not first been wet with the bichloride solution.

After the patient is placed in the hospital and the inmates of the infected house and the premises are disinfected, and if all the inmates have submitted to vaccination and will obey orders, no quarantine is necessary. All those exposed are required to be at home where they can be seen at least every other day for eighteen days. In no other respect need their movements be restricted. They are advised to stay away from public gatherings and to remain at home as much as possible, to escape criticism from neighbors.

Care of persons exposed

The moment any of the exposed shows symptoms of the disease, he is placed in a room and the other inmates required to stay in the house. When the eruption appears, which occurs on the evening of the third or morning of the fourth day of the disease, the diagnosis is complete, and the patient now in turn is taken to the isolation hospital and the house is again disinfected, but now there are no unvaccinated persons who are exposed. The house is free from smallpox and no further watching is needed.

DISINFECTION.

Method of disinfection

In addition to burning mattress and bed covers not easily disinfected by the soaking in a disinfecting solution and boiling, and the free use of the disinfecting solution, a formaldehyde disinfection should be made as follows:

Preparation of rooms and contents

The house to be disinfected is sealed and prepared as usual for sulphur disinfection by pasting strips of paper over cracks of doors and windows. All its surfaces are exposed as much as possible; closet doors are opened and their contents, together with the contents of drawers, are removed, scattered about and the drawers left open; mattresses are set on end; pillows, bedding, clothing, etc., are suspended from lines stretched across the rooms, or spread out on chairs or other objects so as to expose all sides; books are opened and the leaves spread—in short, the rooms and their contents are so disposed as to secure free access of the gas to all parts as fully as possible.

Formalin

For every 1,000 cubic feet of space in the house, suspend by one edge an ordinary bed sheet (2 x 2½ yards) from a line stretched across the middle of the rooms. Properly sprinkled, this will carry without dripping eight ounces of formalin—the 40 per cent. solution of formaldehyde gas—which is sufficient to disinfect 1,000 cubic feet of space. As many sheets as necessary are used, hung at equal distances apart. The ordinary rather coarse cotton sheet should be used in order to secure rapid evaporation. The house should remain sealed not less than eight hours.

When an isolation hospital is to be built, or hastily provided as is usually the case, see to it that the structure is good enough to be occupied by the best citizens. It should be a place to which the mayor and members of the council would be willing to take members of their families if any should be stricken with smallpox.

A proper method of handling smallpox is fairly revealed in the writer's written instructions to medical inspectors with whom he has been associated in suppressing smallpox in Chicago, which reads as follows:

Duties of medical inspectors

"Medical Inspectors must keep in close touch with the Department of Health, so they may be reached without delay when wanted.

"When notified of a suspected case of smallpox, the inspector must go to the case forthwith. An hour's delay may result in many needless exposures.

"The following suggestions as to conduct in the presence of smallpox should be observed so far as the circumstances of the case will permit with safety. The inspector must supply any deficiency in these instructions which the case may demand for the safety of the public.

"On entering the house where there is a suspected case of contagious or infectious disease, do not remove your hat or overcoat; keep the overcoat buttoned.

"Do not shake hands with any one in the house. Do not sit down or touch anything in the house, and especially avoid touching the patient or bed clothing. To expose the patient for examination, call upon the patient or some one present to remove the clothing for you. When leaving the house, have some one open the door, so as to avoid touching any infected door knob.

"Except to vaccinate the inmates of the house, it is not necessary to touch anything about the premises, except the floor with the soles of your shoes. If these precautions are observed there is no danger of carrying the disease to others.

"When it is determined the case is one of smallpox, fill out the history blank provided for the purpose, telephone the information to the department, and promptly mail the filled blank to the Chief Medical Inspector. Telephone instructions as to the disposal of the case, whether an ambulance or a carriage is needed, the amount of disinfecting to be done and the number of vaccinators needed.

"In filling out the blank, secure a list of all who have in any way been exposed to the contagion since the first day of the sickness, learn if letters or laundry have been sent out of the house, and where and to whom sent. Give the vaccinal status of those exposed as far as you can.

"It is the duty of the inspector to vaccinate, or see that some other medical inspector vaccinates, all who are known to be exposed to the infection; do not leave or allow this duty to be done by the family physician. It is the duty also of the inspector to secure the consent of the patient or family for the removal of the patient to the isolation hospital. Do not leave this duty to the ambulance driver.

"Until the ambulance comes the case must be made safe. If it is necessary to police the house to secure safety, do so. After securing the prompt vaccination of all exposed, it is the inspector's duty to see the exposed every other day for fifteen or twenty days. Repeat the vaccination every day for three days without waiting to see the result of the first trial.

"If there is doubt about the diagnosis, vaccinate the inmates of the house, make the case safe to others and see the patient later.

"A medical inspector must be courteous and should be tactful in all his relations to cases of smallpox, the same as a doctor should be in his private practice. He should be a complete master of the situation, able to dispose of complications and duties as they arise, in a proper manner. It should not be burdensome to do so, for the reward is always present, the consciousness that it is life-saving work. Use discretion and secure compliance with the ordinance without force. This can almost always be done, but if necessary the police power can be used to enforce compliance with the law.

"You should read and familiarize yourself with the City Ordinance relating to sanitary work."

VACCINATION.

Value of vaccination

All preventive measures against smallpox are insignificant by the side of vaccination. If vaccination and re-vaccination were properly performed and universally applied, the consideration of palliative and curative remedies would be superfluous. Vaccination, with re-vaccination until the susceptibility to vaccine is exhausted, is an absolute protection against an attack of smallpox. A person thus vaccinated cannot contract smallpox.

A successful vaccination is characterized by vesiculation, pustulation, and a limited inflammatory area with febrile reaction. In about twenty days from the beginning of the course the resulting scab comes off. This leaves a scar which is typical if there is no extraneous infection to cause inflammation and sloughing. Such a vaccination can be secured by using potent lymph which has been freed from pathogenic germs by mixing with glycerine. This vaccination is protective against smallpox for about ten years. Sometimes this single vaccination is protective for a lifetime, but occasionally a person is again susceptible to a mild attack of smallpox in a little less than ten years from date of vaccination.

Effects

Age and periods of revaccination

Every child should be vaccinated before the age of six months, and again at from seven to ten years. The operation should be repeated at periods of seven to ten years during life to make sure the protective influence has not been partially exhausted. If it fails to take it gives no inconvenience and does no harm. If it takes, it proves that the former vaccination is not now, at the time of the retrial, wholly protective. All persons not having had smallpox are susceptible to vaccinia at least once. Repeat the operation a dozen times if necessary to secure a successful result. The statement that this or that one is insusceptible to vaccinia—and consequently smallpox—is responsible for many deaths from smallpox. The writer saw a cashier of a bank die of hemorrhagic smallpox a few years ago, who had been vaccinated five times—all failures. His physician told him he was insusceptible to vaccinia and need not fear smallpox—a bit of false professional advice which cost a useful man his life at the age of 33 years. Inert lymph or faulty technique are responsible for most failures to secure a typical result.

To perform the operation, sterilize the skin, preferably of the left arm—the right if the subject is left-handed. If the subject is a girl, a place high up on the arm near the shoulder; in men and boys at the insertion of the deltoid. Use glycerinated lymph and blow the lymph—not with the breath, but with the rubber bulb furnished for the purpose—on the disinfected skin before scarifying. Take the arm in the hand, and by pressure make the skin on the upper aspect a little tense. Then with the point of a dull, sterilized needle, go right through the drop of lymph, and with slight pressure, irritate and abrade the skin, covered by the drop, until it is red. Lay bare the cutis vera, but do not bring blood. You cannot always avoid bringing a little blood, but if a dull needle is used with slight pressure blood will seldom flow. Scarify a space exactly one-eighth of an inch in diameter, this size: ■

Technique of vaccination

Make but one mark. Vaccinia is a systemic disease, and a single inoculation should be as efficacious in producing vaccinia as a greater number, unless there is an interval of time between the vaccinations. The observations that have been made upon subjects with one, two, three or more scars, have led many to believe that two or more scars are more protective from smallpox than one scar. This I believe applies only where a period of time elapses between the production of a first, second and third scar. A dull needle is the best instrument to use for vaccinating; it is cheap, easily sterilized in a gas jet or flame of a lighted match, and does not terrorize children.

For convenience and clearness of understanding the curative and palliative treatment of smallpox, it is best to consider the treatment as applied to the disease in its various stages—the incubative stage, the invasion stage, the eruptive stage and the stage of desiccation.

THE INCUBATIVE STAGE.

Treatment of the incubative stage

During this stage nothing is known to be of any benefit in staying the disease after the reception of the infection into the blood, except vaccination, and that is of use only when applied during the first three days after receiving the infective agent. Vaccination will always prevent the disease if applied the first two days after exposure to the same, and will, in the great majority of cases, prevent the disease when made use of on the third day after exposure to the smallpox infection. On the fourth and fifth days, perhaps the sixth, if tried, vaccination will modify the disease, but after this time it has no modifying effect.

A person exposed to smallpox should be vaccinated without delay. Repeat the operation the next day, and continue to vaccinate daily until you are sure one of the vaccinations is beginning to "take," then stop. By this method it is almost a certainty that you will secure a successful vaccination in the first three days' period, which insures the safety of the individual. When this practice is followed three or four vesicles may and often do result, but it saves life. If one vaccinates the first day of exposure, and waits to see if it "takes" before making another attempt, it results in the case of failure in losing all chance of preventing the disease. In other words, we have three days or chances to prevent the disease, and use but one. It is safer to make good use of the three chances.

If vaccination is not resorted to early enough to prevent the disease, the victim must meet one of the most formidable and deadly foes known to the human race. Anything that can be done to increase the power of resistance to disease should be done at this stage.

Sustaining efforts

Dr. I. D. Rawlings, of the Chicago Isolation Hospital, has practised and advocates the placing of a person known to be exposed to smallpox in training for the fight with the approaching disease. He forbids alcohol in any form—the popular prophylactic with the laity—and places the subjects upon a good nourishing diet; keeps them in the open air as much as possible, and gives them regular and helpful exercise. He promotes excretion by baths and such laxatives as may be needed. He aims to promote bodily vigor, and thus increase the resisting power against disease. The subject should be kept cheerful and hopeful by encouraging and reassuring advice. This is rational treatment. It fortifies the body against the exhausting influence of this truly frightful disease. Nothing further can be done during this incubative stage.

THE STAGE OF INVASION.

Treatment of the stage of invasion

This stage—which usually lasts three days—exceptionally only two days, and occasionally prolonged to four days—is the initial febrile stage. All we can do in this period is to palliate distressing symptoms and promote comfort. For excessive fever, cool sponge baths, and ice to the head if the headache is severe. Some of the coal-tar preparations, as acetanilid, may relieve backache and headache. To aid excretion and help to reduce fever, liquor ammonia acetatis, two teaspoonfuls every two hours, is of some service. To relieve pain, codeine may be used. Convulsions in children in the beginning are best treated by hot baths, and, if persistent, chloral, well diluted with water to avoid irritating the stomach. The early pain in muscles and back is relieved by two or three capsules of acetanilid, grains iii; monobromate of camphor, grains ii, and citrate of caffein, grains i. Codeine may be added to this capsule if the pain is excessive.

At this stage the nourishment should be cold milk, ice cream and water.

As the stage of eruption approaches all the painful symptoms become intensified. Fever high, frequently 106° F., severe backache, intense headache, nausea, anorexia and sometimes delirium. To relieve these distressing symptoms, morphine given hypodermically is the most effective, one-eighth of a grain, and repeat the dose in an hour or two if needed. The ice cap and morphine often relieve delirium. Bromides and chloral given for delirium are irritating to the sensitive stomach, while morphine is better borne. Cold sponge baths should be continued when the temperature is high, and if the patient is able to stand the exertion, and he usually is, he can be placed in a tub for a cold bath.

On the evening of the third or morning of the fourth day the eruption on the skin appears, and all these distressing symptoms, as a rule, cease. The headache and backache are gone and fever usually disappears. In severe cases the temperature may remain up for twenty-four or thirty-six hours before dropping to the normal. Exceptionally, the temperature may be continuous throughout the course of the disease.

THE ERUPTIVE STAGE.

Treatment of the eruptive stage

As the eruption appears little treatment will be needed for a few days. The patient feels well, and the majority at this time will get up and walk or sit up. This is the period in the disease when the patient will walk out and visit the doctor's office, or take a trip on the railroad to visit friends. He should be kept in bed and given nourishing food during the several days of comparative comfort he will now experience. At this time the appetite is quite good, and the patient can take with benefit to himself a pretty generous diet. Semi-solids can be given freely, such as oat-meal and cream, milk-toast, custard, soft boiled eggs, rice and baked apples. The mild cases never having fever after the invasion stage, can eat steak, chicken, fish, oysters and vegetables.

Mouth and throat

About the second day of the eruption the papules appear vesicular and continue to grow larger and fill with serum until about the fifth day, when the contents turn white or milky in color. This is the end of the vesicular and the beginning of the pustular period. There is almost always absence of fever up to the beginning of the pustular period, and during the papular and vesicular periods the treatment, aside from feeding, is local—principally directed to the throat and mouth. The vesicles in the mouth and throat, covered with the thin mucous membrane, rupture early and leave superficial, sensitive and painful ulcers. If these lesions are treated promptly they will heal in advance of the skin eruptions. This is important, because the patient then can and will take nourishment much better in the later and more severe stage of the disease. Any good antiseptic mouth wash or gargle can be used. Dobell's solution makes a good one. To this a little cocaine can be added if the mouth and throat are very sensitive and sore. This gargle can be used frequently. An atomizer can be used to throw the solution deep into the pharynx.

Conjunctiva

Conjunctivitis, which is frequently noted, is due to the presence of one or more vesicles on the inner surface of the eyelids. It is best not to open these vesicles, as the rough edges of the incision irritate the conjunctiva more than does the unbroken vesicle. Use in the eye freely a saturated solution of boric acid and firmly apply a compress and bandage to prevent use and movement of the eye. Movements of the eye increase the irritation, but the compress must be removed hourly, and the boric acid solution instilled into the eye. The vesicle may form upon the cornea, in such case there is danger of perforation and destruction of sight from deep ulceration. By carrying out the above treatment for conjunctivitis much can be done to lessen the dangers from ulceration of the cornea.

Cannot abort pustules

In this early stage all attempts to avert the approaching pustular stage have been futile. In our experience none of the numerous remedies recommended for internal administration, with a view to aborting the lesions, have in the slightest degree modified the course of the vesicle or pustule. Puncturing the vesicle and cauterizing with a view to lessen the pitting, is a doubtful procedure. Injecting the vesicle with 1 to 200 bichloride of mercury solution, which has been advocated, proves to be useless. All kinds of applications to the skin have been useless in our hands in lessening destruction of tissue. We wrapped a hand and arm with a thick covering of Fuller's earth, glycerine and oxychlorine, and kept it covered without disturbance from the beginning of the papular to the middle of the pustular period. No local treatment was given the other hand and arm. When the dressing was removed it was found the lesions had gone on in their development the same in the arm treated as in the one receiving no treatment. Here also there was a complete exclusion of actinic rays of light, which has been lauded as capable of preventing the development of pustules. Of the red light treatment we will speak farther on.

Critical period

From the fifth day of the eruption on to the eleventh or twelfth day is the suppurative or pustular period of the eruptive stage. This is the period in which the majority of deaths occur. It is the time when the physician and nurse are most needed. Much can now be done for the comfort and safety of the patient. Unremitting care and watchfulness on the part of the doctor and nurse will pilot to recovery through this distressing period many cases which appear hopeless.

At the beginning of this period, in severe cases, the fever returns. This is probably a septic fever. There is an inflammatory area about the pustule and much swelling. Burning and itching comes to torment the sufferer. The condition is similar to that of a man affected with thousands of small boils, upon a large number of which he must lay his whole weight. The torture is extreme. In the confluent form the condition is somewhat similar to an extensive burn of the second degree.

The indications for treatment during the pustular period of smallpox are:

1st. To allay pain and prevent shock and exhaustion.
2d. To support the patient.
3d. To hasten desiccation.
4th. To combat toxemia.
5th. To treat complications.

Owing to the inflammatory condition about the pustules, the pain and distress of body at this period is very great. Fever, sleeplessness and often delirium fast exhaust the patient's strength. At this time bromide and chloral have been given to relieve pain and induce sleep. These drugs are not well borne, nor are they efficient for the purpose of relief of the condition present.

The painful period of acute inflammatory condition of the skin lasts usually from the evening of the sixth day to the morning of the ninth, in severe cases a day or two longer. During this time nothing gives so much relief from pain, itching, burning, sleeplessness and delirium as morphia, one-fourth grain, repeated if need be every four hours. If a larger dose is necessary to secure results, give it. It is well borne and affords sleep and comfort. If there is any pre-existing nephritis, morphia should be used cautiously, if at all.

Nourishment must be administered, though there may be anorexia. A liberal quantity of milk, warm or cold as suits the patient, and ice cream are allowable. If the patient does not retain these, try milk with lime water, milk-punch, egg-nog and kumyss. If all food is rejected feeding by the rectum should be restorted to. In support of patient tonics and stimulants must be used, as indicated by the condition of the pulse and temperature. Strychnia should be given as early as the time when the pulse shows weakness. Begin with the one-fortieth of a grain every four hours, and increase to one-thirtieth grain, given with the same frequency. Brandy should be given for five or six days during the suppurative period, and longer if the patient is absorbing pus from the surface. Alcohol is undoubtedly valuable in the treatment of septic cases and those who were addicted to drink before the attack. Tincture of the chloride of iron and quinia are useful also in combating toxemia. Antistreptococcus serum was abandoned by us as useless after a fair trial.

The cases of true hemorrhagic smallpox are practically hopeless. They all die in six, or at longest seven, days. I have seen but one live to the seventh day. The same supporting treatment given above applies to these cases. Ergot, adrenalin and antistreptococcus serum fail to aid, though they have their advocates.

Local applications during the pustular period, that have been so extensively used, I do not approve of. To allay itching during the vesicular and pustular periods, water with menthol can be used, and sponging for cleanliness and reducing fever, but this readily dries and does retard desiccation. The smallpox lesion in its life history is like that resulting from vaccination. The natural history of the lesion is to fill with serum, turn pustular, dry up and scale off. Nothing should be done to retard this process. The application of continuous baths, poultices, plasters, oils or salves of any kind hinders desiccation. We do not use these applications on a vaccination before desiccation, and why should we try them in the treatment of smallpox?

The mild cases are best treated by arranging so that their bodies are exposed to the sunlight and air. This hastens the drying-up process and shortens the period of pustulation. This treatment I would not advise for confluent cases with secondary fever in warm weather, as the heat of the sun adds to the discomfort, but in the discrete cases it is not uncomfortable and I believe it shortens the course of the skin lesions. Even the patients in the wards notice and remark about those near the windows recovering more speedily than those farther from the windows and sun's rays.

From January 1, 1899 to January 1, 1903, there were treated in the Chicago Isolation Hospital 690 cases of smallpox, mostly of the mild type. They were placed in the sunlight as much as possible. The death rate was but 1.6 per cent.—a better showing than that recorded under the so-called Finsen ray or red light treatment,--the exclusion of the actinic rays of light by means of ruby red window glass.

From January 1, 1903, to January 1, 1906, 1,289 cases were treated in the same hospital with a death rate of 10.5 per cent. The disease had changed to the severe type. This is a low death rate, considering the severe type of the disease. These patients, with the exception of about seventy in the red light ward, were given plenty of light and air in wards with large windows on both sides and one end. About seventy of these patients were put in a ward from which the actinic rays were rigidly excluded. This red light treatment not only proved worthless, but was harmful. The red light gives patients in delirium the impression often that the house is on fire. Finsen claimed that this treatment, if begun the first day of the eruption, would prevent the formation of pus. In no instance in our experience (and we gave it thorough trial) did the treatment in any degree modify the course of the disease. The red light treatment for smallpox cannot be recommended.

As the pustular period advances, the lesions rupture from the weight of the body, and the bed sheets stick to the raw surface of the lesions. The sheets should be dusted with a powder composed of boric acid and subgallate of bismuth. Sheets must be changed several times daily when the pustules begin to break down. Warn patients against scratching the face. Adults can be influenced not to scratch the lesions, but children cannot resist the itching, and should have their hands enveloped in cotton covered by sterile gauze. This will prevent scratching. If the itching cannot be resisted, it is better to delay desiccation by applying carbolized vaseline 3 per cent., to which is added 2 per cent. menthol. Or oxide of zinc ointment, to which is added one drachm of campho-phenique to the ounce, and 2 per cent of menthol. If the pustules run together and become large blebs filled with pus, resembling the blisters from burns, the contents may be let out by incision and the dusting powder freely applied. This condition is often seen on the hands and wrists.

THE STAGE OF DESICCATION.

Treatment of stage of desiccation

When the pustules are dried, forming scales, the patient is ready for antiseptic baths, which loosen the scabs and disinfect the surface of the body. The baths found most efficacious are bichloride of mercury 1 part to 1000 of water; and equally as good permanganate of potash enough to color the water a light pink. Then the protecting salves can be freely applied. As all pustules are dried now, salves will soften and hasten desiccation. Nourishment should now be given freely. Semisolid diet, and in a few days solid food, can be taken with advantage. The appetite is usually good, and a substantial diet can be given, including meats. If there is anything the patient needs now it is food, and he should have three meals daily and a lunch between meals. This is the stage when abscesses, boils, local surface infections, impetigo, erysipelas and gangrene are found, though gangrene of the scrotum has occurred in the pustular period. All complications of this kind should be treated the same as when encountered unaccompanied with smallpox. Pneumonia, bronchitis, pleurisy, laryngitis and nephritis may occur. The diet must be restricted in case of nephritis.

In mild cases no "pitting" remains after recovery. In the severe cases there is no treatment which we have tried that will prevent pitting. Smallpox, like other morbid processes, is a disease of degree. Some will have small pustules with a comparatively mild inflammatory manifestation. Some cases will even abort in the papular or vesicular period and escape the inflammation of the pustular period. If the pustules are large and well filled with pus, and if the epidermis is thick and tenacious, the pus will be held down under the pressure until the inflammation extends through the cutis vera. Destruction of skin, with "pitting" is the result.

To summarize: Smallpox is absolutely preventable by vaccination.

There is no known medicine which in any way modifies the disease once it is well started.

The treatment consists in intelligent nursing and the use of such palliative and supporting remedies as are known to give and conserve strength.

YELLOW FEVER.

(By Dr. Albert J. Mayer and Dr. Urban Maes, New Orleans, La.)

In yellow fever we are to-day, as with many other diseases, without a specific. The treatment is entirely symptomatic. In the antitoxin of Sanarelli, discovered in 1895, and published in 1897, it was hoped that a specific had been found, but experience showed its insufficiency.

In order to intelligently treat yellow fever symptomatically it is necessary to touch briefly the various phases of the pathology of the disease as they arise. Primarily, we must remember that yellow fever is an acute, infectious, febrile disease caused by an, as yet, unknown organism. The toxins of this organism, circulating in the blood, have certain deleterious effects on the human economy, briefly, as follows:

1. They act as a medullary poison, exerting an early influence on the vomiting centers. (This symptom is partially due to the capillary stasis in the stomach with mucous and submucous hemorrhages.)

2. They produce vaso-motor paresis, hemolysis and disintegration of the capillary walls by fatty degeneration, which is part of the general steatosis.

3. They cause pathological changes (fatty degeneration) in the liver and kidneys, characterized by jaundice and usually by an acute desquamative nephritis.

Hygiene

At the first appearance of the symptoms of the disease the patient must be put to bed. Rest, both mental and physical, is an absolute requirement. The patient must not be allowed to raise his head off the pillow. Defecation and urination must be performed in the recumbent posture and the supply of fluids should be administered by means of a tube or feeding cup. The best observers are unanimous in agreeing that these statements are to be taken in their most literal manner and the physician cannot afford to deviate from them in the slightest particular from the first moment of attack.

After being put to bed the patient is clad in the lightest of garments so arranged that in order to sponge him it will be unnecessary to put him to the slightest exertion. A tepid cleansing bath is given and the patient is placed in the best lighted and ventilated room in the house. Measures of hydrotherapy which may later become necessary must be done with the utmost gentleness, in fact some observers go so far as to claim that yellow fever being a self-limited disease it is better to ignore the pyrexia on account of the accompanying disturbance of bathing. They believe that the pyrexia is far less dangerous than the moving of the patient. We think, however, that a certain amount of personal cleanliness adds to the comfort of the patient and does much towards hastening convalescence.

A mouth wash of some alkaline antiseptic solution as chlorate of potassium is of service in diminishing the tendency towards gingival hemorrhage besides alleviating the bad taste. Enemata of soap suds and water should be given every day or every other day according to indications, but care must be taken not to irritate the rectum as it may be our sole reliance for sustaining and treating the patient.

The foot bath

From time immemorial the initial measure of treatment which has stamped itself most emphatically upon the minds of the practitioners in the localities subject to the invasion of "Yellow Jack" has been the mustard foot-bath or the foot-bath à la Creole.

A foot-tub is partially filled with warm water to which is added a pound of freshly ground mustard dissolved in cold water. This tub is placed in the bed; the feet of the patient are then immersed. The patient and tub are covered with two or three woolen blankets. Every three or four minutes a pint of almost boiling water is added to the bath, the feet and legs of the patient being rubbed rather vigorously. The sudorific effect of the bath must be kept up for at least ten minutes and its effects aided by the giving of hot aromatic drinks, hot lemonades or teas.

This has been in such universal use in New Orleans in the epidemics of '53, '65, '78, '97, that a physician is rarely called to see a case where this step has not been taken by some member of the household, and supplemented by wrapping in blankets and the administration of some hot, aromatic drink to serve as a diaphoretic and diuretic. There is no doubt that in its present form it is of decided value in relieving the head symptoms and the congestive phenomena of the first stage of the febrile paroxysm. (Matas.)

If the case is seen early an initial purge of calomel in small doses should be given and followed, if the stomach permits, by some saline cathartic. After the first stage of the disease is passed and the caplliary stasis becomes marked, with nausea present, acting as an index of the congestion of the internal organs, it is not advisable to use this routine. The predisposition to gastric hemorrhage may be thereby augmented, consequently the laxative enema is preferable.

The cephalalgia and rachialgia are best met by topical applications, the ice-bag to the head and the mustard plaster or other counter-irritant to the loins. The coal-tar derivatives and other sedatives, such as codeine and morphine, are only mentioned in this connection to be condemned. As has already been shown the toxins exert such a potent influence on the organs of elimination and circulation that it is unwise to tax them further.

The remedies which have been lauded for the nausea are legion. The entire group of anti-emetics, including carbolic acid, cerium oxalate, cocaine, creosote and the much vaunted bichloride lemonade of Sternberg have proven non-efficacious. The simplest treatment is the best. When cracked ice, carbonated drinks or iced dry champagne fail to relieve, it is the wisest plan to give the stomach absolute rest and supply fluids and other nutriment by rectal administration.

That usually ominous sign "black vomit," or gastric hemorrhage, is best met with perchloride of iron. (Guiteras.) This writer also claims that in hemorrhages from other mucous membranes (gingival, intestinal and uterine) this drug has given him the best results. His experience with adrenalin has not served to recommend its use. Ergot, digitalis and aconite have also been recommended but have not given good results. Counter-irritation over the stomach, ice-bags, mustard plasters, blistering with cantharides or the actual cautery, and dry cups are of little value.

Pyrexia

Temperature is best controlled by hydrotherapy. The tub bath as used in typhoid is never employed in this malady, but sponging and packing are the measures most often resorted to. Enemata of cool water can also be used as a means of reducing the temperature and stimulating the patient. In addition they furnish the body with the fluid so necessary for the dilution and the elimination of the poisons of the disease.

In Las Animas Hospital hydrotherapy was used to the complete exclusion of drugs, and striking results were obtained. Gorgas, of this hospital, says, "Generally when the temperature remains above 103° for any length of time I have the patients sponged every two hours with cold water."

Because of the capillary stasis occurring in this disease the sponging is best accompanied by mild friction. Ice bags to the head and back of the neck are beneficial, insomuch as they are useful in the general scheme of hydrotherapy and are grateful to the patient.

Here we again mention the whole group of antipyretic drugs to state that while they may have a certain limited field of usefulness they are not to be recommended as a routine. The use of the cinchona group has long since been abandoned.

Anuria

The most grave condition with which we have to contend is complete suppression of urine. This should not be confounded with simple retention which can be relieved by catheterization. The possible occurrence of urinary suppression must always be borne in mind. Albuminuria, which appears in most cases on the third day, should, for safety's sake, be regarded as a forerunner of this condition. Daily examinations of the urine are absolutely necessary. A scanty flow with an increasing albuminuria and microscopic findings, indicative of the severity of the kidney lesion, calls for energetic measures on the part of the attending physician. Once such a state is established, therapeutics are of little avail; consequently we should endeavor to forestall this condition by appropriate measures.

When the stomach will allow, large draughts of hot or cold water, flavored or not, as best suits the patient, are to be given. The alkaline waters, such as Vichy (Celestin), Apolinaris and White Rock are of great value. The necessity of giving a large amount of fluids having been demonstrated, the rectum must be resorted to where the nausea proves intractable. Hypodermoclysis and intra-venous infusion with normal saline solution have been used but it was the experience of Matas and others in New Orleans in '97 that when suppression actually existed even this was useless.

The diuretic drugs, more particularly the citrate and acetate of potassium combined with the infusion of digitalis, still have a more or less deserved reputation in the hands of some practitioners. Their usefulness cannot be doubted in mild cases and when employed early in the attack. Dry and wet cups are also used.

There is no disease in which we can less afford to dispense with the aid of a competent nurse. The value of her services can only be measured in terms of human life. With the innumerable calls that are made upon a physician's time in yellow fever stricken communities the necessity of accurately recorded observations, especially of pulse, temperature and the organs of elimination in each case, are of the highest value. There is no doubt that the professional nurse is no small factor in the reduction of the mortality of yellow fever. To quote from Osler, "Careful nursing and a symptomatic plan of treatment give the best results."

Stimulants

After the initial fever of forty-two to seventy-two hours' duration we have a secondary rise and it is in, or following, this stage that the patient is most often brought face to face with death. Stimulation with strychnia in doses of one-sixtieth to one-thirtieth grain hypodermically every three to four hours, supplemented by mild alcoholics, preferably in the form of iced champagne and Ducro's elixir, panopepton, and the digested beef essences, are indicated at the first signs of failing circulation. In this secondary fever, called the fever of auto-intoxication by Sanarelli, various intestinal antiseptics, more particularly salol, were faithfully tried in Havana but, as shown by Gorgas and Guiteras at Las Animas in 1900, they are of doubtful value.

Diet

We have already spoken of the gastric irritability and what its persistence means. All physicians are agreed, and it may be laid down as a dogmatic fact, that during the first four days of the disease no nourishment should be given except water which may be supplied to the point of toleration. By the fifth day the crisis has usually passed, and we may then begin with milk in small quantities, plain, or with the addition of lime water. The quantity of nourishment is gradually increased with the addition of broths and strained soups. This liquid regimen should be continued until the beginning of the second week, when the patient may be allowed to sit up and begin a gradually increasing diet.

Prophylaxis

While the present prophylaxis of yellow fever has only been established since 1900, Finlay of Havana, as far back as 1881, had already given up the fomites theory and had begun to suspect that some blood-sucking insect acted as the intermediary host of the yellow fever organism.

The peculiarities of the stegomyia fasciata, its methods of feeding, its universal presence in the zones liable to epidemics and its hibernation coincident with the disappearance of the disease in the zones of accidental infection, led him to direct his investigations towards that particular mosquito. In 1898 he announced the following conclusions, on which was based the work of later investigators and upon which rests our present system of scientific control:

1. That the germ of yellow fever is only pathogonous to human beings when introduced by inoculation.

2. That the regular process by which the inoculation of the germ is accomplished in Nature, is through the bites of the culex mosquito (stegomyia fasciata), the insect having previously become contaminated through the act of biting a yellow fever patient within the first five days of his attack.

3. That although the bites of a recently contaminated mosquito can produce at most only a very mild attack of yellow fever, or simply confer patent immunity without eliciting any obvious pathogenic manifestations, the bites of the same insect when its contamination dates back from several days or weeks, might produce severe or fatal attacks.

4. That the yellow fever mosquitoes after they have once become contaminated, retain the power of inoculating the disease during the rest of their lives. Carter's work* was to the effect: effect:

1. That yellow fever was a house disease.

2. That a house infected with yellow fever was not infective until a certain period of time had elapsed. He fixed this period at from ten to twelve days. It remained for the United States Army Commission under Dr. Walter Reed, consisting of Reed, Lazier, Carroll and Agramonte, to show conclusively that the blame belonged to the female *stegomyia fasciata*, thus confirming Finlay. Later commissions, notably those of the Liverpool School of Tropical Medicine, the Hamburg School of Tropical Medicine, working parties of the United States Public Health and Marine Hospital Service, and independent investigators, especially Guiteras, working along these lines further fixed upon the stegomyia fasciata as the sole agent capable of transmitting the disease.

Prior to 1901 sanitarians devoted their efforts in stamping out the disease in accordance with the theory of fomites, but the labors of the above mentioned scientists, and the work of Gorgas

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***New Orleans Medical and Surgical Journal*, 1900.

in eradicating the disease from Havana, its perennial home, showed clearly that the prophylaxis of the yellow fever lay in the destruction of the stegomyia fasciata, for in the words of Carroll, "*No mosquitoes, no yellow fever.*"

Prophylaxis general

Yellow fever, distinctly an acute, infectious disease, is transmitted from individual to individual, as far as we know, by the agency of the female stegomyia fasciata, and therefor it can be eradicated as an epidemic by the destruction of this mosquito, and the individual can be safeguarded by being protected from the bites of an infected insect.

In instituting prophylactic measures against yellow fever, we must bear in mind, the following facts:

1. That the yellow fever patient is capable of infecting the stegomyia fasciata during the first three days of the disease only. (The yellow fever cadaver is not infectious.)
2. At least twelve days must elapse before the bite of an infected mosquito can transfer the active poison to a non-immune.
3. The period of incubation is from forty-one hours to five days and seventeen hours. (*United States Army Commission.*)
4. No direct transmission from patient to patient has ever been recorded except by experimental inoculation.
5. The infectious life of the stegomyia fasciata ranges from twelve days to fifty-seven days (Reed), to one hundred and ten days (Guiteras).

In safeguarding the non-immune, it is obvious from the foregoing facts that the mosquito must be prevented from attacking the patient during the first three days of the disease. This is best accomplished by placing the sick person in a carefully screened room, which has been freed from mosquitoes by fumigation, and under a mosquito netting which has at least 18 meshes to the inch. Further, the entire house, except the sick room, must be fumigated within twelve days of the onset of the fever, in order to destroy any stegomyias that may have become infected prior to the recognition of the disease. And finally, the entire house, including the sick-room, must be again fumigated after the recovery of the patient. When this procedure is carried out, the danger to susceptible persons in the house and neighborhood is practically nil. This was the method pursued successfully in Havana by Gorgas, and his successors, except, where it was possible, under a military regime, to remove the patient in a screened conveyance to Las Animas Hospital. In cases of this nature, all the mosquitoes in the infected house were immediately destroyed by fumigation with pyrethrum. The evolution of yellow fever prophylaxis as practiced on a large scale was best depicted in controlling the spread of the disease after it had gained a firm footing in New Orleans in 1905. The successful and remorseless war raged, not against the invisible and unknown foe of former years, but against the well-known striped or tiger mosquito, will live forever in the annals of preventive medicine and sanitary science, as the most brilliant achievement in the history of any nation.

In all cases where possible the following routine was followed: A room adjoining that of the patient was carefully screened and sealed; it was then fumigated with sulphur (two pounds to the thousand cubic feet), and thoroughly aired. The patient was then transfered to this room and the remainder of the house fumigated in the same manner. In cases seen after the first three days of the disease the patient was transferred to another room if possible, and the room fumigated in order to kill the infected mosquitoes before they could get out to deposit their eggs after their essential meal of blood. This killing off of the infected mosquitoes in the room itself, and the neighboring buildings is the *sine qua non in* combating a yellow fever epidemic.

Unsuspected cases, and cases not easily recognized, as are not uncommon among children, sometimes furnish hidden foci which remain as a source of infection to the entire vicinity. In instances of this sort, wholesale mosquito destruction becomes imperative. The breeding places must be ruthlessly destroyed.

Maritime prophylaxis

Guiteras, the greatest living student of yellow fever, recognizes three areas of infection.

The focal zone in which the disease is never absent. This formerly included Havana, Rio, Vera Cruz, and the ports of the Spanish-American main. Thanks to the labors of the sanitary workers we can eliminate two of these, Havana and Vera Cruz.

2. The peri-focal zone or regions of periodic epidemics. This zone includes the port of the tropical Atlantic in America and Africa.

3. The zone of accidental infection between the parallels of 35° South and 45° North. The peri-focal and the zones of accidental infection can be protected from the introduction of the disease by efficient quarantine regulations preventing the ingress of infected persons from infected ports, and establishing such a period of detention that the disease may have time to develop before suspected non-immunes are allowed to enter a non-infected port.

SYPHILIS.

(By Dr. F. Kreissl, Chicago.)

The treatment of syphilis is both a local and a constitutional one.

Local treatment

(1) With local treatment we attempt to destroy, or at least weaken, the specific virus wherever its initial presence is evidenced by pathological lesions. This may be accomplished by *cauterization* or by *excision* of the venereal sore.

Excision of chancre

According to Fournier excision gives an average of one success in five cases, the success depending upon the length of time between the appearance of the chancre and its surgical removal. Even if failure as an abortive procedure occurs, the excision of the chancre certainly renders the subsequent course of the disease much milder.

Cauterization of chancre

The cauterization of the venereal ulcer is less effectual as an abortive means. In fact, I do not believe that such is possible, but it unquestionably lessens the severity of the subsequent symptoms. Neither procedure is indicated when the adjoining lymphatics are already involved.

Antiseptics locally

The venereal ulcer should be treated on general surgical principles like any other wound. We employ mild antiseptic solutions like two per cent. carbolic acid, or 1 in 3000 bichloride of mercury for cleansing, followed by a thin layer of dusting powder on the dried surface. Most effective, but obnoxious on account of its odor, is iodoform used pure or with equal parts of boric acid. Instead of this dermatol, iodol, or europhen may be employed. Gauze compresses saturated with any of the above solutions may be applied several times a day to chancres with sluggish granulations showing little tendency to heal. Gangrenous or phagedenic chancres require cauterizing with the Paquelin, followed by the application of the nitrate of silver pencil, or a ten per cent zinc chloride solution, or nitric acid. Sometimes cauterization will have to be preceded by a thorough curettage of the ulcer, both procedures requiring a general anesthetic. As soon as the ulcer has a healthy appearance and one does not wish to commence with the constitutional treatment, it should be covered with Unna's mercury plaster mull, to be changed once or twice a day, depending on the amount of wound secretion. This plaster mull is applied even after the sore has healed, as long as the induration is noticeable. If phymosis has been caused by chancre, and if the latter is not accessible to local treatment, we expose the ulcer by circumcision or by a dorsal division of the prepuce.

Chancres in the vagina and on the cervix are exposed by a speculum and treated in the same manner as elsewhere, but the mercury is applied as ointment on a gauze tampon. The latter has to be omitted during pregnancy and in its stead vaginal balls of equal parts of cocoa butter and mercury ointment are inserted. Initial lesions in the mouth and on the tonsils require daily applications of a ten per cent. solution of bichloride of mercury in alcohol or ether.

Venereal papillomata yield to the daily application of resorcin.

℞

Resorcin	9.0
Sacchar.	1.0

Sig. Dusting powder.

Or

℞

Resorcin	5.0
Aqua distil.	100.0

Sig. Apply on gauze sponge.

Or

℞

Acid lactic	
Ether sulph. āā	10.00
Hydrarg. bichlor. cor.	0.10

Sig. Apply with a brush once a day.

Very effective because one application usually suffices is:

℞

Plumb. causticum	
Solut. Kalin caustic (30 %) āā	7.50
Lithargyri	0.25

Sig. Apply with the point of a wooden stick.

This mixture is applied to the whole growth and the healthy skin protected during the application. Papillomata resisting this treatment are curetted and cauterized with Paquelin. The condylomata around the anus usually disappear under calomel dusting powder and an isolating gauze pad.

Indurated lymph glands are covered with mercury plaster mull.

Suppurations

Suppurating glands have to be opened and treated in the following manner: After shaving and cleansing the region in the customary way and anesthetizing with ethyl-chlorid, an incision is made in the long axis of the bubo and carried down to the pus cavity; the latter is not only exposed, but its contents are squeezed out with the fingers by rather hard pressure all over the region. This is kept up for a minute or so until the fluid becomes free from pus and appears sanguinolent. The abscess cavity should not be irrigated, only the edge of the wound cleansed with boiling hot water. Now the wound is closed by an interrupted horsehair suture. No drainage is necessary. The region is cleansed with hot sponges once more and a gauze collodion dressing applied. Over this comes a compressing pad and bandage to be maintained for several days. The sutures are removed after ten days, at which time, if at all, healing by primary union has occurred.

Onychia and paronychia require a daily local bath in bichloride of mercury solution in the strength of 1 in 2000, followed by a dusting with

℞

Calomel	2.0
Talcum venet.	20.0

Sig. Dusting powder.

Gummata

Gummata which are not yet liquefied or not exulcerated are often absorbed by tincture of iodine or mercury plaster mull, or a ten per cent. calomel traumaticin applied daily.

℞

Calomel	5.00
Traumaticini	20.0

Sig. Shake well, apply with brush.

An exulcerated gumma is treated like a phagedena ulcer: mucous patches in the mouth like ulceration therein.

Constitutional treatment

The constitutional treatment should be commenced as soon as the syphilitic character of the ulcer is with certainty established and the healing process retarded and in all secondary and tertiary manifestations of the disease. The sovereign remedy is mercury. It is administered: 1. By the mouth. 2. By inunction. 3. By injection.

Preceding the treatment attention should be paid to the condition of the gastro-intestinal tract, the diet regulated, the urine examined and the mouth and teeth put in the best possible condition.

Mercury by the mouth

By mouth, mercury is given in pills or capsules, but we must remember the caustic action of the drug on the intestinal tract. Hydrargyrum oxydulatum tannicum is very effective.

℞

Hydrargyrum oxyd. tannic.,	2.50
Opii p.,	0.25
Sacch. lact.	3.50
Lanolin	1.25

M. f. pill—No. 50
Sig. Four to six pills a day.

Opium is added when the bowels are very loose. Hydrargyrum oxydulatum tannicum is incompatible with carbonates and iodine preparations.

Equally reliable as the above is

℞

Hydrarg. protoiodid.	1.50
Decoct. opii aq.,	0.50
Lanolin	1.50
Sacch. lact.	4.50

M. f. pill—No. 50.
Sig. Four to five pills a day.

The prescription should call for a small number of pills, in order that they may be fresh. Those which are kept in stock are sometimes very old and get so hard that the gastro-intestinal juices are not able to dissolve them; many disappointing results are due to this fact.

Mercury, given by mouth, should be taken immediately after a meal. In case of diarrhea its use must be discontinued and opium given. If the intestinal irritation recurs after the drug is resumed, this mode of treatment must be abandoned and inunction or injections resorted to. More recently cypridol, a one per cent. solution of biniodide of mercury in oil, has been used. It is given systematically for three weeks in the first three months in doses of two capsules, three or four times a day after meals. For the following three months the same amount is given every alternate fortnight and after that eight days of each succeeding month for three consecutive years. The claim is made that it is not as irritating to the gastro-intestinal tract as the other preparations of mercury, which limits their value on account of the small amount of the drug that can be administered by mouth.

Mercury by inunction

For inunctions unguentum hydrargyri is used, mixed with equal parts of unguentum petrolatum. It is dispensed in gelatin capsules or in paraffin paper, each containing two to three grammes of the ointment for an adult and one-half to one gramme for a child.

℞
Unguenti hydrargyri
Unguenti petrolati āā 1.50
(Caps. gelatin) paraffin paper No. XII.
Sig. Use as directed.

Wherever possible easily accessible hairless portions of the skin are selected, and each inunction applied to new parts following a set cycle as, for instance,

First night—arms and forearms.
Second night—both sides of chest.
Third night—the loins.
Fourth night—the abdomen.
Fifth night—inner surface of thighs.
Sixth night—no inunction, warm bath.
Seventh night—inunction as on first night, etc., etc.

In this way unnecessary cutaneous irritation is usually avoided. (Eczema mercuriale—Folliculitis—Toxic Erythema.) The inunction should be made by the patient himself, but if made by anyone else rubber gloves should be worn. Each rubbing requires about twenty minutes, and it is a good plan to rub in small portions—about the size of a bean—of the ointment, this procedure to be repeated when the skin becomes dry.

Disadvantages of inunctions

The disadvantages of this mode of treatment are its uncleanliness; the irritating effect on the skin; the time consumed by each application; and the impossibility of an exact dosage. Most of the mercury contained in the ointment evaporates when brought in contact with the living body, the greater part of the vapors entering the system through the respiratory organs, the smaller part through the skin. This explains why patients treated under otherwise identical conditions sometimes are easily salivated and at other times do not seem to respond to the treatment at all. These different observations largely depend on the temperature surrounding the body after the inunction. Instinctively older syphilologists ordered the inunctions to be made in superheated rooms and had the patients wrapped in flannel blankets for hours afterwards.

Mercury plasters

Instead of the mercurial ointment, mercury plasters or the plaster mull spread over large areas of the body may be used to advantage, especially in children. It is renewed once a week.

℞

Emplastr. hydrarg. oleinicum	
Emplastr. plumbi olein.	āā 140.0
Hydrargy depur.	
for adults	60.0
for children	30.0
Sig. Plaster	

Mercury baths

Another way of administering mercury externally is the bichloride of mercury bath, but, in order to be really effective, i. e., penetrate through the skin, it has to be given in connection with electri kataphoresis, which is accomplished by the electric two-cell bath.

The quantity required for a bath varies from ten to fifteen grammes of bichloride of mercury. It is useful in the treatment of very young children, and of moist papular, pustular, and ulcerating syphilitic lesions on the skin.

Mercury subcutaneously

For the subcutaneous application of mercury soluble and insoluble preparations are employed. They are injected hypodermically or intramuscularly. Best known and most generally used, among the soluble preparations, is the bichloride of mercury. It is prescribed in one per cent. to five per cent. solutions to which is added sodium chloride, which prevents the precipitation of albuminates of mercury.

℞

Hydrarg. bichlor. corros	1.0-5.0
Natrii chlor.	1.0-5.0
Aqua distill.	100.0
Sig. Bichloride solution.	

Usually 1 cc., equal to 0.01 of bichloride of mercury, is injected in the gluteal region daily, or every other day, as the case may require. It is well to follow a certain routine in injecting. The injection should be given alternately in the left and right buttock, in and outside of a vertical line crossing its highest elevation, so that the solution is deposited in a new place each time. It should be injected slowly in order to avoid painful bruising and unnecessary destruction of tissue; a slight massage following the withdrawal of the needle will spread the fluid over a larger area. The syringe may be made entirely of glass or of glass with hard rubber trimmings, the needle of platinum-iridium—1¼ to 1½ inches long and narrow gauged. When using shorter needles the fluid is placed too close to the skin, causing inflammation, eventually even necrosis; while, when longer needles are used, as for intramuscular injections, these are followed by extremely painful infiltrations. With needles of the above length, I am able to deposit the fluid in the loose tissue right over the gluteal muscles, avoiding all these disagreeable features. What little pain is experienced ceases soon or is shortly checked by the application of heat. The platinum-iridium-needle is preferable to a steel needle because the latter easily becomes corroded and punctured along its walls, allowing the solution to escape through these little holes into tissues close to the skin, producing the above inflammations. It is hardly necessary to say that the same antiseptic precautions as in ordinary hypodermic injections should be rigidly observed, or to mention the yet quite rare possibility of an embolus, due to the puncturing of an injection into one of the large gluteal veins.

Cypridol may also be injected hypodermically like bichloride of mercury in the dosis of 0.5 cc., equal to one one hundredth grain of the bichloride. The needle used must be of larger size on account of the oil passing through it. Otherwise the same rules as in bichloride injections apply to its application.

Lang's "gray oil"

Of the insoluble mercury preparations Lang's "gray oil" has stood the test of many thousand cases within the last twenty years. It is a compound of fat, oil and metallic mercury, dispensed as a fifty per cent. and a thirty per cent. liquid. The former consisting of two parts of mercury and one part each of lanolin and vaselin oil.

℞

Unguent cinereum lanolinat. forte	9.0
Olei vaselini	3.0

Sig. Oleum cinerum 50%.

The fluid is slightly warmed and well shaken before being used. The dose for one injection is 0.05 cc., equal to 0.04 metallic mercury, and is administered in intervals of three days until a decided improvement in the symptoms becomes apparent, when but one injection a week is given and two more injections in an interval of two weeks after all symptoms have subsided. Rarely more than twelve injections are required to accomplish this end.

The oil is deposited in the back about two inches from the dorsal spine. The needle is inserted almost parallel to and underneath the cutis. If this is observed the injection is almost painless and not followed by induration and inflammation. This is due to the lack of corrosive properties of the remedy and the very small quantity incorporated which precludes bruising or destruction of tissue. Each following injection should be placed about two inches from the preceding one. If it is desired to inject more than 0.05 cc. this should be done in two equal parts of 0.05 cc. and in two different places. The advantages of the gray oil are, as said before, the small volume required for one application, the absence of reactive inflammation and the longer remanence of the preparation which establishes a reserve in the tissues to draw upon much longer than from soluble mercury solutions. But therein lies also the danger of an oversupply in the hands of those not familiar with the drug, the disease and the symptoms.

Comparison of methods of using mercury

Reviewing the various methods of administering mercury, we can see the superiority of subcutaneous injections. They permit an exact dosage, guarding in this way against either mercurial intoxication by an overdose, or insufficient action by loss of part of the drug on its route to the circulation. No inconvenience in their application is experienced, no uncleanliness likely to call the attention of others to the ailment connected with it, and gastro-intestinal irritation and skin lesions are practically unknown.

Tonics

Simultaneously with the administration of mercury a tonic must be given. I have found peptomanganate of iron and the irontropon most valuable.

Mercurialism

Irrespective of the way mercury is incorporated, symptoms of mercurialism are occasionally observed; sometimes due to an overdose and at others to an individual idiosyncrasy. The manifestations observed are stomatitis, gastro-intestinal irritation, toxic erythema, anemia, neurosis, and neuritis. As soon as these symptoms occur, the administration of mercury must be discontinued. Most of the trouble soon passes off and the treatment may be resumed. In the cases of idiosyncrasy other remedies will have to be employed.

Iodine preparations

Iodin is next to mercury and most used in combating syphilis, especially the potassium iodid, the sodium iodide and the rubidiumiodide. The latter is comparatively free from the toxic qualities of the other two preparations. The dose varies from 1.0 to 10.0 and more pro die. It is given by mouth in liquid or pills, excepting in intolerance of the stomach, when it is used in aqueous solution by rectum.

℞	
Potass. iodid,	
Or	
Sodium iodid,	
Or	
Rubid. iodid,	5.0-10.0
Aqua distill.,	200.0
Sig. One to three tablespoonfuls in water, essence of pepsin, or milk, three times daily.	
Or	
℞	
Potass. iodid,	10.0
Or	
Sodium iod.	
Sacchar. lact.,	5.0
M. Ft. Pill No. 50.	
Sig. Two to ten pills a day.	

Iodism

The most common symptoms of iodin intoxication (iodism) are severe headache, coryza, edema around the eyes, cough, acne and iodin exanthema. Should any of these symptoms appear the iodin medication must be discontinued. The addition of a grain of belladonna extract to fifty pills frequently prevents iodism.

Potassium iodid is incompatible with calomel, forming a caustic compound and they should not be prescribed together.

The iodid preparations are very effectual in the late forms of syphilis—serpiginous syphilide of the skin, gummata of the skin, fascia, muscles and bone syphilis, ulcerations of the pharynx and larynx, syphilis of internal organs and the central nervous system. They have to be used in malignant syphilis, instead of mercury, at least for a while preceding the administration of the latter drug and in all cases of idiosyncrasy for mercury. It is very effective with or without antipyrin for severe headache, pain in bones and joints preceding or accompanying the eruptive stage.

℞	
Antipyrin,	2.0—3.0
Potassium iodid,	4.0—8.0
Aqua distill.,	200.0
Sig. A tablespoonful in water, twice or three times a day.	

Mixed treatment

It is the remedy of choice in syphilis of tuberculous, scrofulous, highly emaciated patients. In malignant syphilis, iodin preparations instead of mercury are used until the general condition of the patient permits the employment of the latter drug. The indications for the choice of iodine in these cases are easily recognized by the fact that in spite of the mercury the progressive nature of the lesions cannot be checked. In some very stubborn cases decided improvement will follow the combined administration of iodine and mercury after either of them employed separately have failed to be effectual.

Duration of treatment

How long to continue the treatment of syphilis depends on the views one holds regarding the nature of the trouble. Some believe in the temporary treatment, others in the continuous treatment, and the followers of Fournier in the chronic intermittent or interrupted treatment. While the adherents of the first method believe in treating only in the presence of visible lesions, the advocates of the second method administer mercury, or mercury alternating with iodine and other drugs, more or less continuously for a number of years, irrespective of the presence or absence of luetic manifestations. The temporary treatment evidently is inadequate, while under the continuous method a tolerance for the specific drugs is established which weakens their therapeutic effect.

The best results observed belong to the third method. The treatment should extend over a term of not less than three years, and in the absence of special indications not over five years. If injections or inunctions are used, the patient should first receive as many as are required to make the symptoms disappear, and then half as many more. Then comes an interval of about two months which, in the first year, may be utilized to give iodine for four weeks. Then again half as many injections or inunctions as were given altogether in the first course, and this followed by four weeks of iodine medication and four weeks of rest. The same procedure is repeated once more. In the second and third year, unless the indications require a change from the routine, this course of treatment may be given twice each year, and in the fourth and fifth year one course only.

Hereditary syphilis

Hereditary syphilis has to be treated upon the same principles as the acquired form. As a result of the preventative mercurial treatment of a luetic mother apparently healthy children are frequently born. The same procedure ought to be tried where the mother appears healthy but the father is luetic

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